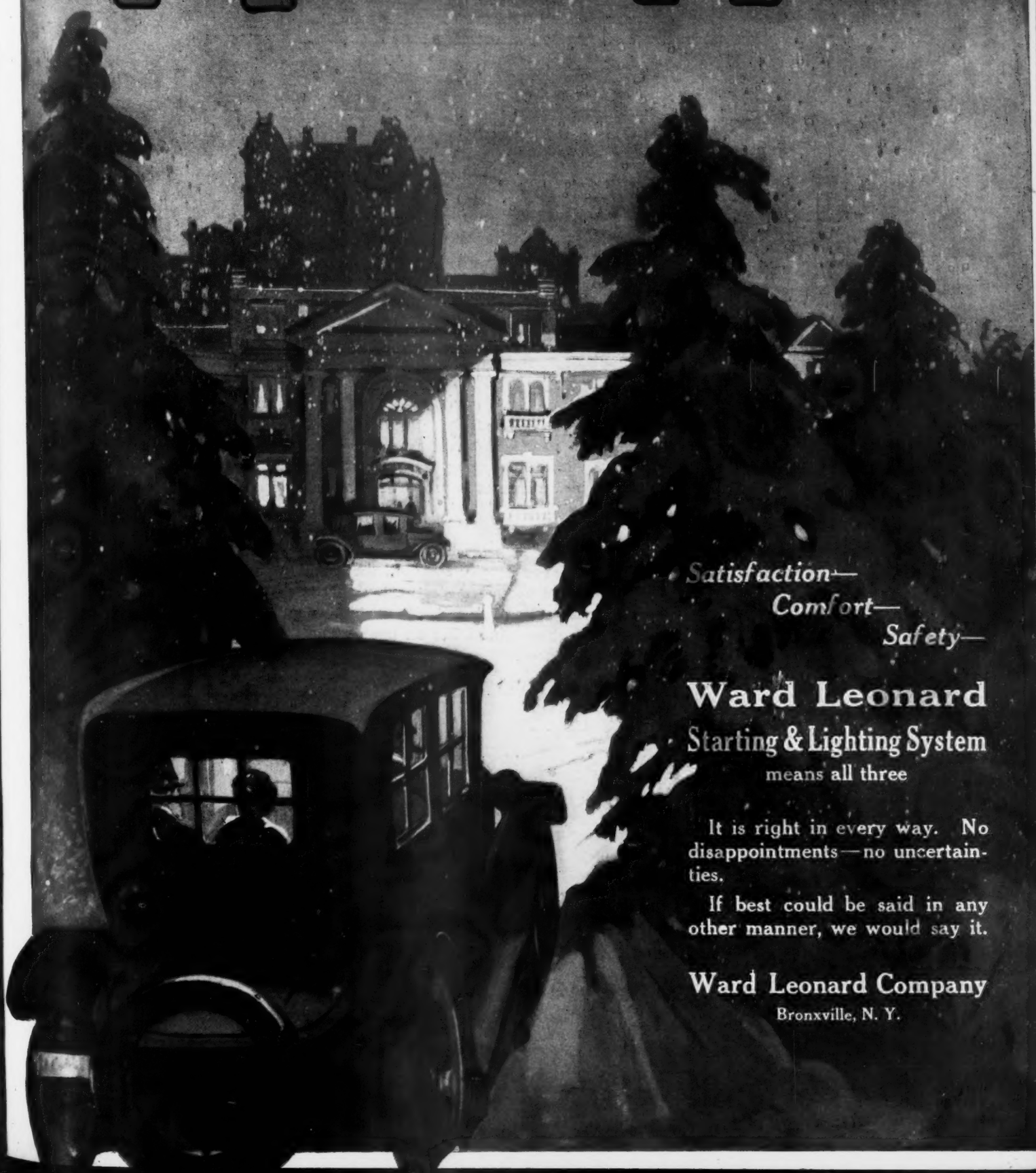
JAN. 8, 1914 25¢ A COPY

MOTOR AGE



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Comfort—
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It is right in every way. No disappointments—no uncertainties.

If best could be said in any other manner, we would say it.

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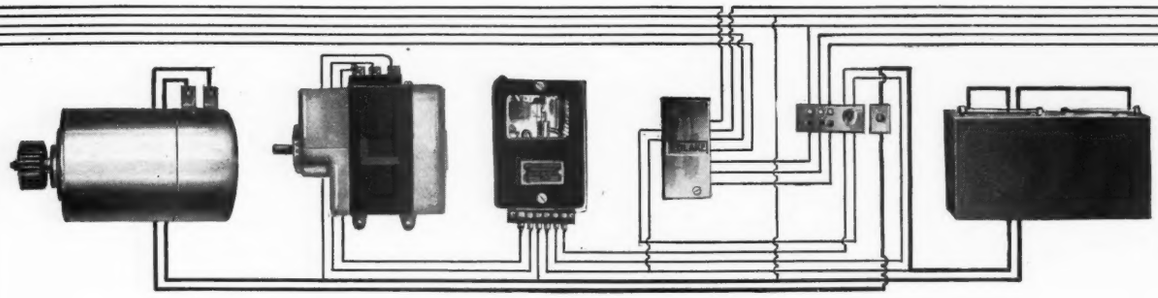
Bronxville, N. Y.



The Adams & Westlake Co.

Established 1857

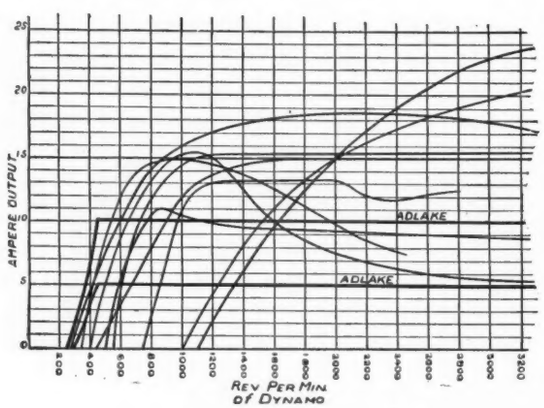
317 W. Ontario Street, Chicago

The Adlake Dynamo

THE Adlake Dynamo of the Adlake Automobile Electric Lighting and Starting System is a six volt machine, designed to turn out ten amperes at 450 R. P. M. It has a capacity for fifteen amperes continuously where unusually severe service makes this desirable.

The Adlake Dynamo, operating at one and a half engine speed, will turn out ten amperes at a car speed of nine miles per hour in high gear. Ten amperes is sufficient to carry the load of all the lamps on the car. This means that there is no drain on the battery when the car is making nine miles an hour in high gear, with all the lamps lighted. A man seldom drives long at nine miles an hour without dropping back into second, and as soon as he does this, the engine speed increases in proportion to the car speed, and the dynamo again carries the full load.

The advantages of such an equipment will be readily appreciated, and any system considered for lighting and starting automobiles should be subjected to this test. Of course, it is equally essential that at high car speed the dynamo shall not turn out an excessive current, but that is the function of the Adlake-Newbold Dynamo Regulator, which maintains an output of ten amperes at any car speed above nine miles an hour. The Adlake-Newbold Regulator comes next week.



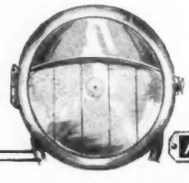
The curves on the left were plotted by a prominent user of the Adlake Automobile Lighting and Starting System in comparison with other systems.

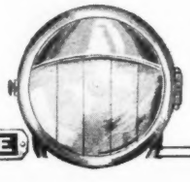
Lower curve—touring rate.
Upper curve—night or winter rate.

Note first, that the Adlake Dynamo carries full load at the lowest R. P. M. (450 R. P. M.). This means that the dynamo can carry the full load of the lights when the car is making nine miles per hour in high.

Note second, this flat output curve is the genuine characteristic of the Adlake Dynamo. The regulator sensitively varies resistance in series with the dynamo field, to compensate for every change in the speed of the engine. This characteristic flatness of the curve, insuring minimum variation of the strength of current, results in long life for the battery and for the lamps.

Low output
at low speed means
dead batteries





High output
at high speed means
burnt batteries

It's a Whole Lot More Important—

THAT YOU HAVE GOOD BEARINGS IN YOUR CAR THAN THAT YOU HAVE A GOOD SELF-STARTER, OR ANY SELF-STARTER

JOT THIS DOWN IN YOUR NOTE BOOK

"SEE NON-GRAN EXHIBIT SURE,
CHICAGO SHOW,
JANUARY 24th TO 31st, BOOTH 90."

REPAIR MEN

REPAIR MEN WHO GIVE YOU NON-GRAN BEARINGS TELL YOU SO JUST AS THE BETTER-CAR MANUFACTURERS DO.

3,200 automobile repair shops are making all their bearing replacements with genuine NON-GRAN Cored Bars. As a result, their reputations for stand-up work are bringing them, combined, millions of business every year.

There are forty-two standard size NON-GRAN Cored-Bars, but just ten of these sizes meet 93½ per cent. of the total demand. With these ten bars in your shop you can make nine out of every ten bearings and bushings for which you have a call.

These ten sizes constitute the SPECIAL NON-GRAN GARAGE ASSORTMENT.

Let us tell you about it and quote you prices.

A POSTAL WILL BRING FULL INFORMATION BY RETURN MAIL.

The better-car manufacturers see to it FIRST that you get good BEARINGS. Then they ALSO see to it that you get a good self-starter and OTHER good and up-to-date equipment.

But—a few car manufacturers give you the sort of bearings that cost them the least money, and attempt to sell you their car on the strength of some good self-starter, because they have an idea that this good self-starter is going to make you think that the CAR ITSELF must therefore be good.

The self-starter isn't going to keep your car out of the REPAIR SHOP, nor is the lighting system, nor is the speedometer, nor is the top, nor is the twelve-inch upholstering, nor any of the other necessary, but decidedly MINOR features which some manufacturers attempt to blind you with.

If you want your car ON THE ROAD, if you want it to cost you little to RUN, go deeper than the mere starting of it. Go right down to the vitals—the BEARINGS—the little parts that take the WEAR and therefore determine the LIFE of the car.

The manufacturers of the better cars in the low-price field, as well as those in the medium and high-price fields, give you bearings and bushings of—

HIGH-SPEED
NON-GRAN
BEARING BRONZE

AND THEY TELL YOU SO

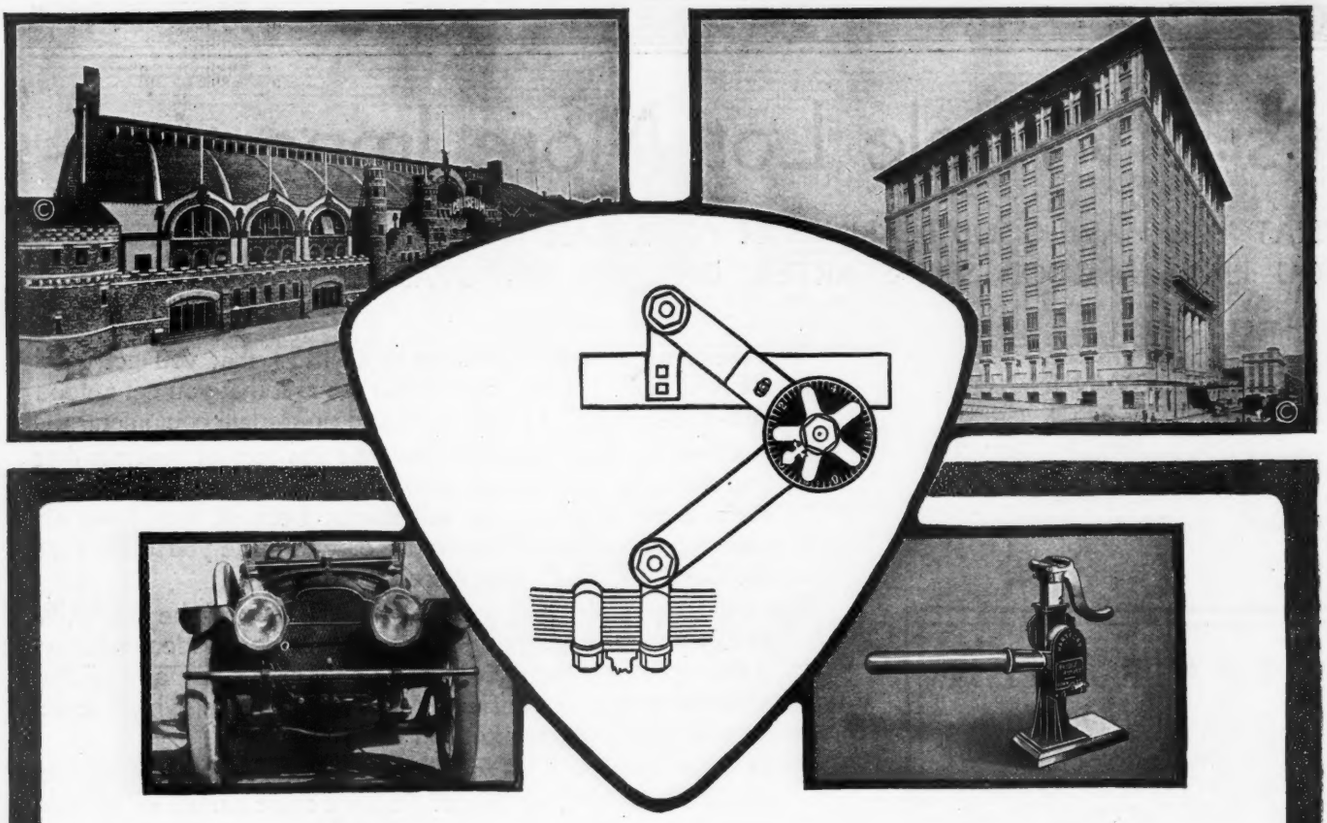
Manufacturers who skimp on these little bearing parts (which are way inside the mechanism of the car and which you can't see) say NOTHING about their bearings, and draw your attention right up to the self-starter and the beautiful lamps.

To REPLACE a worn bearing (and a worn bearing MUST be replaced) will cost you anywhere from $25 to $200 depending upon how much labor is necessary in tearing down to REACH the bearing.

It's better to pin your man down BEFORE you buy, and judge of a car by its VITALS rather than by its ACCESSORIES—important as these accessories may be.

AMERICAN BRONZE COMPANY

142-182 LANCASTER BOULEVARD, BERWYN, PENNA.



Hartford Accessories will be Exhibited and Demonstrated at Both Shows

EFFICIENCY of equipment is as much to be desired in a car as efficiency of construction. The high degree of efficiency attained in Truffault-Hartford Shock Absorbers, Hartford Bumpers, and Hartford Auto-Jacks is attested by the fact that nearly every high-grade, up-to-date American car is furnished with one or more of these Hartford-built accessories.

Truffault-Hartford Shock Absorbers are included as Standard equipment on the output of twenty-five of the greatest automobile factories in the world. They have brought easy riding and greater economy to over 200,000 motorists. The device is yet to be conceived which can satisfactorily take the place of the Truffault-Hartford. Four models including the New Automatic—be sure to see this latest Truffault-Hartford at the show.

Come and examine the Hartford Auto-Jack. It has three times the lifting efficiency of the ordinary jack—is better designed, better built and better finished without being over-priced. And Hartford Bumpers are designed to give thoroughly effective protection without marring the appearance of car or adding excessive weight. The method by which they are attached is a distinct improvement.

Hartford accessories are always interestingly exhibited and demonstrated. That is possibly the reason why the Hartford Suspension Company's Booth is always a center of interest for show goers.

HARTFORD SUSPENSION CO.

EDWARD V. HARTFORD, Pres. **Office and Works: 146 Bay Street, Jersey City, N. J.**

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Volume XXV JANUARY 8, 1914 No. 2

Contents

THE NEW YORK SHOW 5
Fourteenth annual exhibition remarkable for display of light sixes and cyclecars—Improvements in body lines noted—New models announced

IMPORTERS DISPLAY CARS AT HOTEL ASTOR 10
Ten European and two American makes shown in salon—Body styles

THE S. A. E. MEETING 14
Engineers elect H. M. Leland president, and discuss subjects pertinent to the industry

MAKERS SAVE SURPRISES FOR PALACE SHOW 20
New York public has first opportunity to inspect late models

EDITORIAL—THE NEW YORK SHOW—ELECTRIC TRANSMISSION 24

CARTOON—MOTORIA HAS RIGHT OF WAY IN NEW YORK 25

BODY STYLES AS SEEN AT NEW YORK SHOWS 26
Comparison of coach work at Palace and importers' salon redounds to credit of Americans

THE ESSENCE OF THE AMERICAN MARKET 32
Average car in all four price classifications—Prognostications for 1915

FITMENTS FOR THE MOTOR CAR 36
Trends in accessories for 1914—The Crown Prince steel wheel for passenger cars—The Entz electric transmission system described

THE ELECTRIC STARTERS 42
Various systems described and illustrated

RECORD FOR BLOCK TEST BROKEN 52
Moline-Knight runs continuously for 336 hours, averaging 38.3 horsepower—No adjustments made

FORD TO GIVE EMPLOYES $10,000,000 54
Profit-sharing system idea which will raise wages—Idea commended by secretary of commerce

SHOW TIME FINDS GENERAL TRADE GOOD 56
Prosperity reports from several big cities

DEPARTMENTS

Manufacturers' Communications 50
Readers' Clearing House 58
Cyclecar Development 60
Realm of Commercial Car 62
From the Four Winds 64
Coming Motor Events 64
Among Makers and Dealers 65
Recent Incorporations 65
Brief Business Announcements .. 67
Motor Car Repair Shop 68

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will give you the kind of satisfaction you expect—a dollar couldn't possibly buy you better service.
Have your dealer show you a Bosch Plug—compare it with any other he sells—you'll be convinced Bosch is best—convinced by its excellent construction—but there's the name "Bosch" that assures you complete satisfaction, assures you real service.

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Making The Good Car Better

The good automobile, whether it sells for $1075 or $7000, is a better car if equipped with a highly efficient electric starting-lighting system.

So much depends upon the electric system that it becomes one of the most important parts of the car.

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GRAY & DAVIS
STARTING - LIGHTING SYSTEM

This system makes the good car better. It is found on any car, regardless of price, whose manufacturer is intent upon securing starting-lighting reliability and service for the owner.

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GRAY & DAVIS, Inc., **Boston, Mass.**

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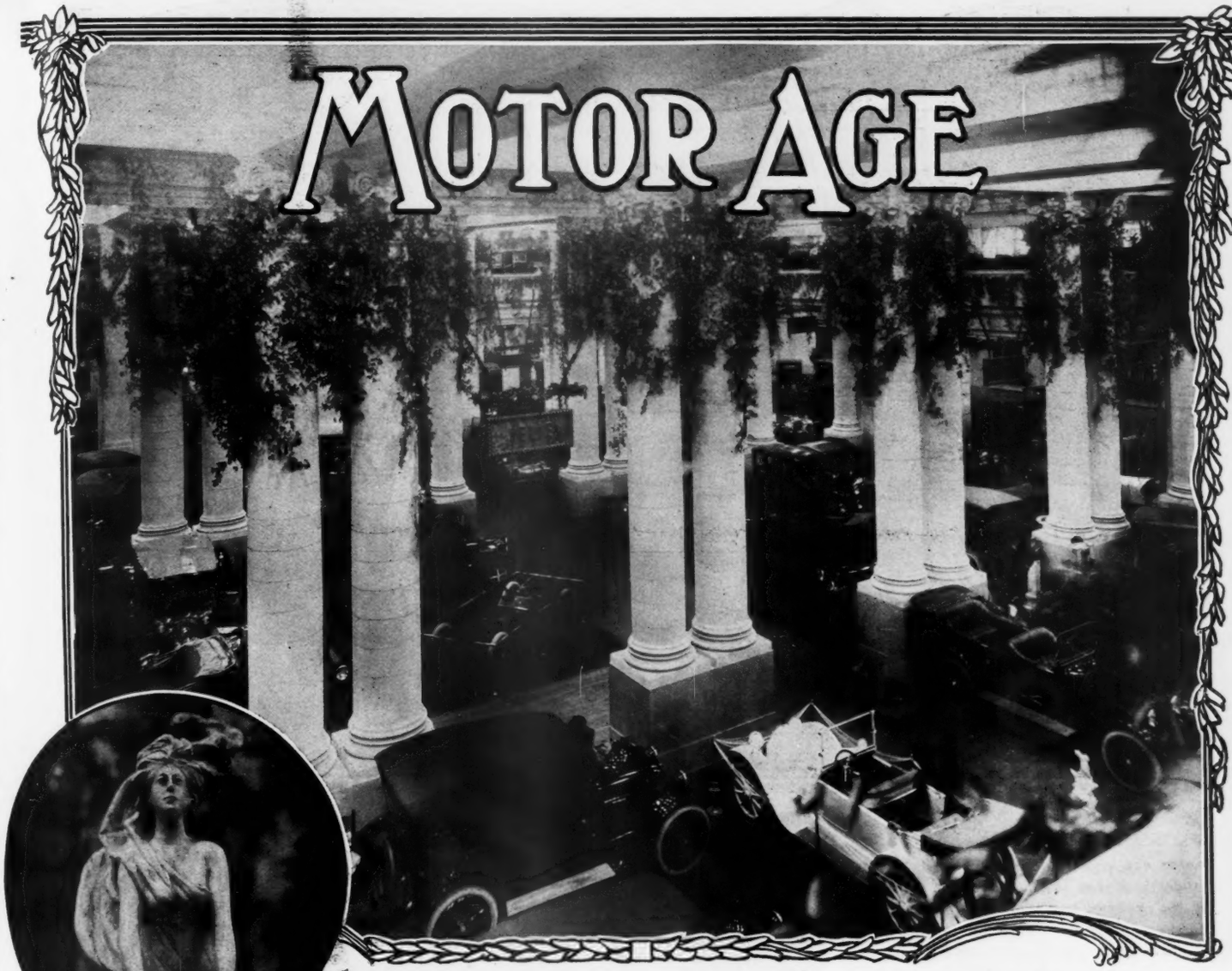


The New York Show

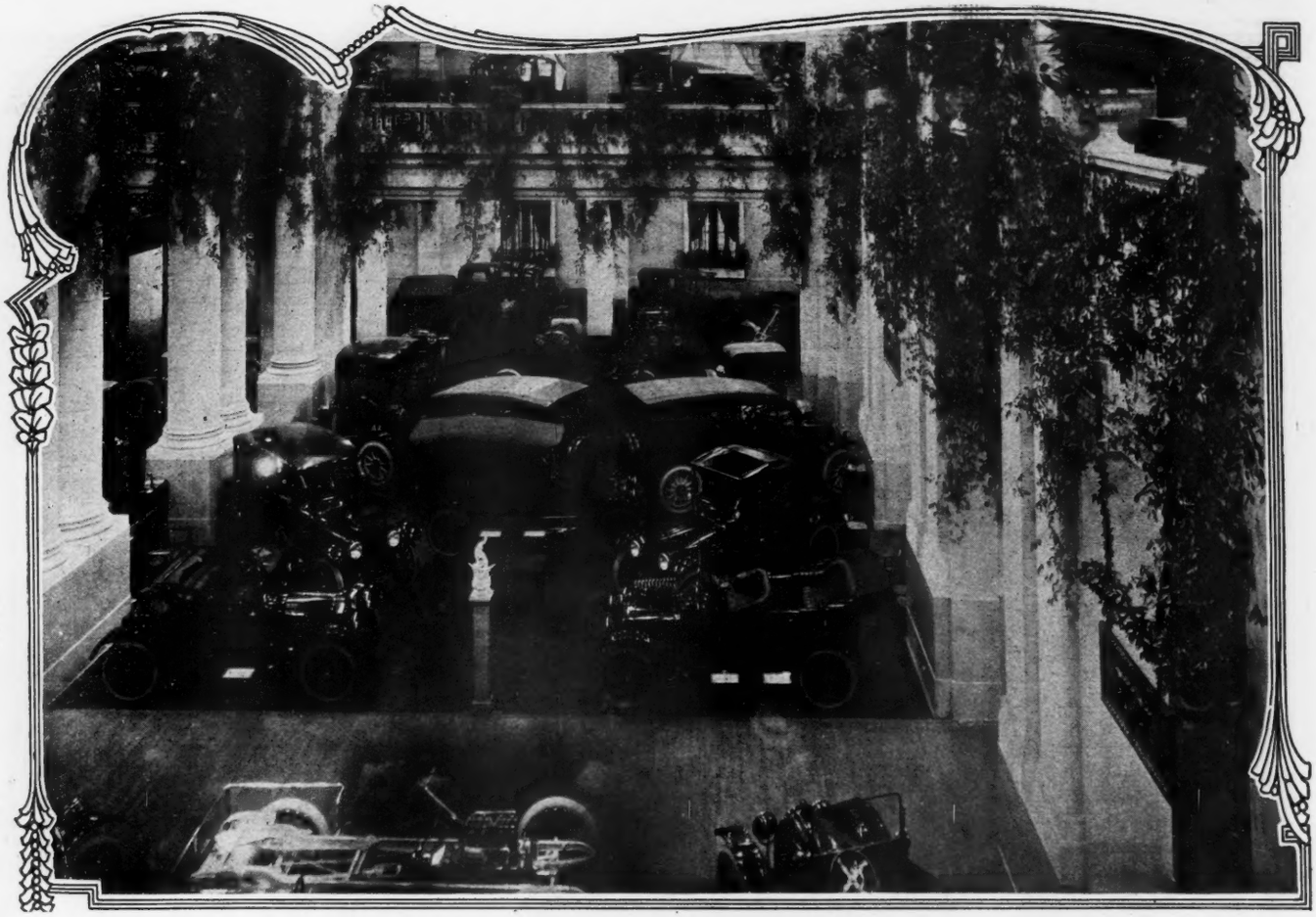
Fourteenth Annual Exhibition Remarkable for Display of Light Sixes and Cyclecars—Improvements in Body Lines Noted—Several New Models Announced

By Darwin S. Hatch

NEW YORK, Jan. 3—America's first exhibition for this year of the motor cars for the new season opened this afternoon as the fourteenth annual national show in New York occupying the Grand Central Palace, the same building which housed a part of the exhibition last year. This time it is held under the auspices of the National Automobile Chamber of Commerce, Inc., the successor of the National Association of Automobile Manufacturers and the Automobile Board of Trade, which were the sponsors of last year's production. It is handled by the show committee of the National Automobile Chamber of Commerce, Colonel George Pope, H. O. Smith, Wilfred C. Leland and S. A. Miles, the latter acting as manager. The show ends January 10.

When the doors of the Grand Central Palace were thrown open at 2 o'clock, visitors found everything in readiness for once. Days of feverish but systematic labor on the part of the management and the exhibitors had borne splendid results, and everyone was impressed by the absence of the usual hurrying and scurrying of attendants intent upon the installation of eleventh-hour exhibits or putting the finishing touches upon the decorations.

Today is the first time in the history of the fourteen shows which have been staged since the



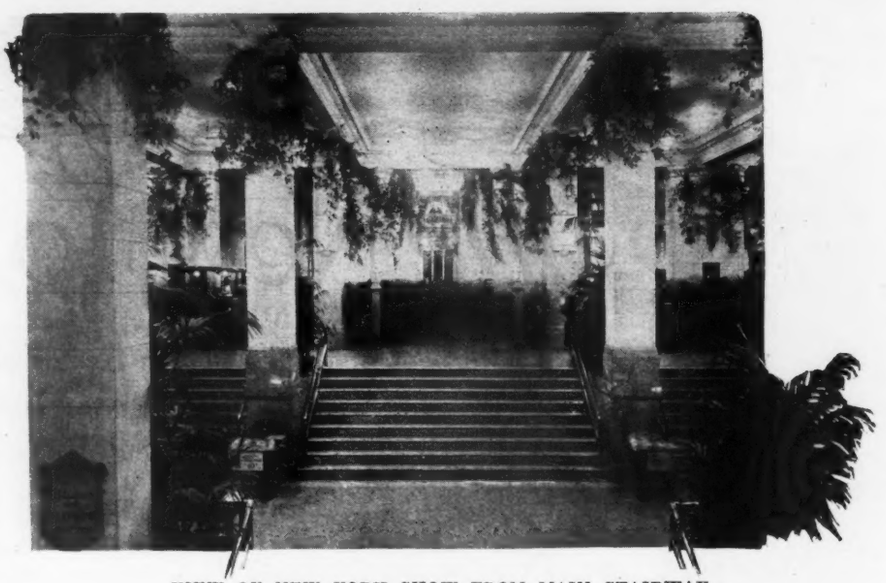
VIEW OF FIRST FLOOR TAKEN FROM THE BALCONY

motor car industry assumed the form and proportions that justified a public exhibition of its products that the opening took place in the afternoon. There no longer is the need for frantic haste at the last minute nor the unpreparedness that has characterized the opening days of earlier shows. The congestion that always occurred Saturday night was relieved.

Only Pleasure Cars Shown

Instead of the 2 weeks of exhibition, which has been the rule heretofore, there will be only 1 week, the show of commercial cars which previously has been the feature of the second week having been dropped this year, the entire exhibition being strictly a passenger-car affair. Last season there were two shows running simultaneously, one in the Palace and the other in the old Madison Square Garden, but this season it has been deemed advisable to stage the national show under one roof, and the Palace, offering more floor space, was selected. It is under the direct management of S. A. Miles, who has directed all of the Chicago exhibitions and some of those held in New York.

There is a larger number of exhibitors at the Palace this week than ever were before gathered under a single roof during an American passenger car show. In some former years the total number in both Garden and Palace and the Coliseum and Armory at Chicago exceeded this. The



VIEW OF NEW YORK SHOW FROM MAIN STAIRWAY

total number of exhibits this year is 352, including seventy-eight gasoline cars, of which five are cyclecars, six electrics, 255 accessories and thirteen motorcycles. There are 492 different cars on exhibition, ranging in price from $395 to $7,200, the total cost of the exhibits being approximately $3,550,000.

The Grand Central Palace has been arranged in such a way that the show is a four-level exhibition. Motor cars occupy the first and second floors and all the wall spaces of the third floor, while accesories and motorcycles are shown on the fourth and a part of the third floor. This gives a total floor space of 120,000 square feet.

The architectural design of the Palace lends itself admirably to the decorative scheme of the exhibition. This is a Corinthian court and upon entering the

SIDE AISLE ON MAIN FLOOR, LOOKING WEST

CENTER AISLE OF MAIN FLOOR, LOOKING SOUTH

building the visitor receives the impression of being in a great marble hall. White and green is the color combination, green smilax and vines entwining the white marble columns. Miles has added to the motorists' mythology with a new goddess, "Motoria," the divinity of the car, whose statues are mounted upon numerous pedestals about the building.

They depict the figure of a young girl in graceful, wind-blown drapery, gripping the steering wheel of a car and on her face the delight of the joy-rider.

Spaces Carpeted with Maroon

The spaces are carpeted with a special woven fabric of maroon tint and neat signs in green and gold hang on chains between the columns. The balustrades surrounding the court on the second floor together with the massive column that arises to the third level give the effect of a mezzanine floor gallery.

One of the features which shows careful planning is the method of handling the crowds by which congestion is relieved and the different floors made equally desirable as locations for the exhibitors. The elevators all run direct to the fourth or top exhibition floor, without stopping at the intermediate ones and carry no passengers downward. Consequently visitors are forced to descend on foot and visit each floor. The scheme worked admirably because the visitors were very evenly distributed throughout the building and there was no congestion at any point. Tonight's crowd was a capacity one—rather unusual for first nights.

Cyclecars Make Their Debut

The present show will have a particular attraction for the man with the slim pocketbook because of the number of small light cars and cyclecars on exhibition. This is the first time that Americans have had the opportunity to see our latest development, the cyclecars, in a general gathering. Interest in them is added by the expectation of seeing the cyclecars which are being driven from Detroit under the leadership of W. B. Stout, of Chicago, and which will be placed on exhibition as soon as they arrive. Among the new light cars and cyclecars on hand already are the Briscoe, the Carnation, the Saxon, the Twomb-

VIEW OF ACCESSORY EXHIBITS ON THE FOURTH FLOOR

ley, the American and LaVigne, while the Cornelian and Imp are on the way.

Special highly finished bodies in a number of the booths increase the general air of elegance, although there is less of the tissue paper and ribbon style of decoration in the car exhibits. Overland is showing a closed car for the first time, a coupe of pleasing lines and interior finishings. Among the specially finished exhibits are the Packard landau, Pierce brougham, Velie's touring car, finished in white, Abbott in green, Paige in green with gold stripes, Peerless, Locomobile, Longchamps berlin, White berlin, Stearns Holbrook limousine, Loziers' canary yellow roadster and touring car, Premiers Weidley-engined runabout, National new six coupe, Maxwell 25th landaulet, Jeffery sedan, Cole roadster finished in white, Cadillac sedan, Cameron sedan with chair seats, Briscoe's little tourist in white, Lyons-Knight sedan, Keeton convertible roadster, Stevens-Duryea limousine, Waverly five-passenger coupe finished in gilt with one side removed, Baker electric in white and gold, Fiat limousine and roadster, Pathfinder sedan and cruiser, Oldsmobile victoria and Marion showing inclosed cars and sixes for the first time.

Motors Are Featured

There are thirty-seven chassis, most of which are arranged to be working and a number are cut out with glass cases to show the operation of the interiors. Likewise there are a number of motors arranged on stands to show features of their operations. Among them Lozier shows a four and a six, Oakland has a motor working, the Fischer Magic is out for inspection at both the Fischer and the Palmer-Singer booths, Chandler has a polished power plant and at the Great Western booth is the new Carter engine cut out to show the valve action. Willys-Knight and Moline each show a sleeve-valve engine, Speedwell has a painted chassis showing its Mead motor. Oldsmobile has a cutout motor with red bulbs showing the order of firing. Marmon has the lower half of the engine illustrating its pressure oiling.

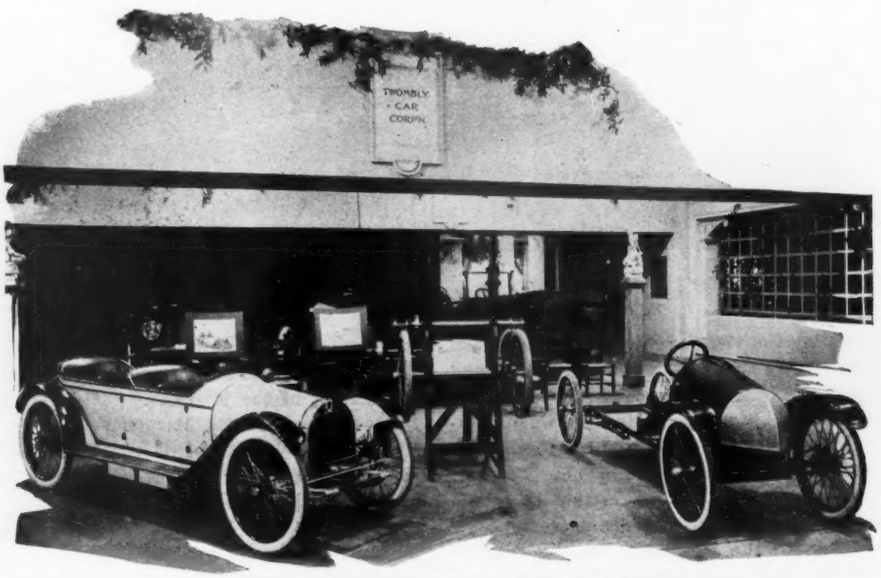
Lectures at Four Booths

At the Chalmers, Cadillac, Jeffery and Mitchell booths special lectures are in progress in which the merits of these cars are explained with the aid of working, cutout chassis. Haynes shows its electric gearshift.

Among the newest of the productions at the show is the Fischer-Magic motor which has been mentioned before in Motor Age as the Mondex-Magic, the change of name occurring only within the last few weeks. This has the new Magic motor and the Fischer-Magic gearset as well as body features which create much comment. The body has individually curving panels with a downward sweep in the center of each. The top disappears into the body, there being a box-like arrangement around the back of the back seat to receive it. Packard's new 4-48 is on display as is the new Chalmers little six and the new Pathfinder Daniel Boone model. The new light cars and the Willys-Knight have been mentioned. The Standard, made by the Standard Steel Car Co., and marketed by Johns-Manville Co., makes its first appearance as a four cylinder.

Knight Engines in Evidence

Non-poppet motors are more in evidence this year. The Knight-engined cars include the new Willys-Knight which replaces the



DISPLAY OF TWOMBLY CYCLECAR MAKER

Edward-Knight; the Lyons-Knight, the Stearns and the Moline. The Fischer appears on the Palmer-Singer and the new Fischer-Magis. The Carter appears as an option on the Great Western, while Speedwell has the Mead.

Wire wheels are quite in favor at the stands, the following cars having these on one or more models: Abbott, Kissel, Paige, Stearns, Premier, Krit, Chalmers, Cole, Twombley, Fischer, Briscoe, Haynes, Stevens-Duryea, Willys-Knight, Fiat, Moline-Knight, Pathfinder, Stutz and Oldsmobile.

Pointed or rounded radiators are frequent appearing on the Abbott, Paige, Jackson, Premier, Cameron, Davis, Fischer, Briscoe (with a headlight in it), Carnation, Moline-Knight and Pathfinder.

Sixes and electric starters and body designs seem to be creating the most interest in general. Most of the demonstrations consist of starter features. Among the accessories also, the electric lighting and starting apparatus is taking up a great deal of space with the combniation and double deck system much in evidence.

Accessories Designed for Comfort

Features of the accessory exhibits, as a whole, may be concentrated in the words comfort and efficiency. This is typified in nearly every class of fitment for the car. Carbureters are designed to give easier starting and better economy and to have fewer moving parts to get out of order. Dash and steering wheel controls are being applied to practically all of them, where as in one case the starting adjustment is not interconnected with the starter pedal. Economizers and manifold heaters are numerous.

Magnetos have developed in the line of easier starting and more complete inclosure from dust and water. The effect of the smaller car idea is making itself felt in the magneto, as several makers bring out types for very small four-cylinder motors and cyclecar engines. One concern has extended its automatic advance feature to all its models. Another concern definitely abandons the induction type of armature which was a feature years ago. Another, formerly a low-tension adherent, brings out high-tension models.

VIEW OF EXHIBITS ON THE THIRD FLOOR

The signal field is remarkable for the number of hand-operated horns, giving almost the convenience but not the expense of the electric. Electric horns have developed more from the point of view of the body designer than any other way. New types of horns to correspond with the tapering bodies have appeared. Their bells are smaller at the front than at the rear so that they not only look well on tapered hoods but are claimed to give greater projection of sound. The under-the-hood type of horn is much in evidence. These have squat bodies and small projectors and are less highly but more permanently finished than those exposed to view.

Speedometers Improved

Speedometer makers are giving more attention to steadiness and dials that are more easy to read. Clock combinations are plentiful and artistic. Windshields are one piece, easier operated and integral with baseboard.

Visitors at the show have found several surprise parties awaiting them in the shape of new models that made their debut in the Palace today. Some of them had been saved specially for display at this time, among them being a new big Packard, a Chalmers little six, a new Krit special touring car, and a Daniel Boone type of Pathfinder. Then, too, Benjamin Briscoe is showing the new Briscoe, designed in France, and which will be built in this country at Jackson, Mich. John N. Willys uncovered the Wilys-Knight which had its origin in the Edwards-Knight, absorbed by Toledo capital.

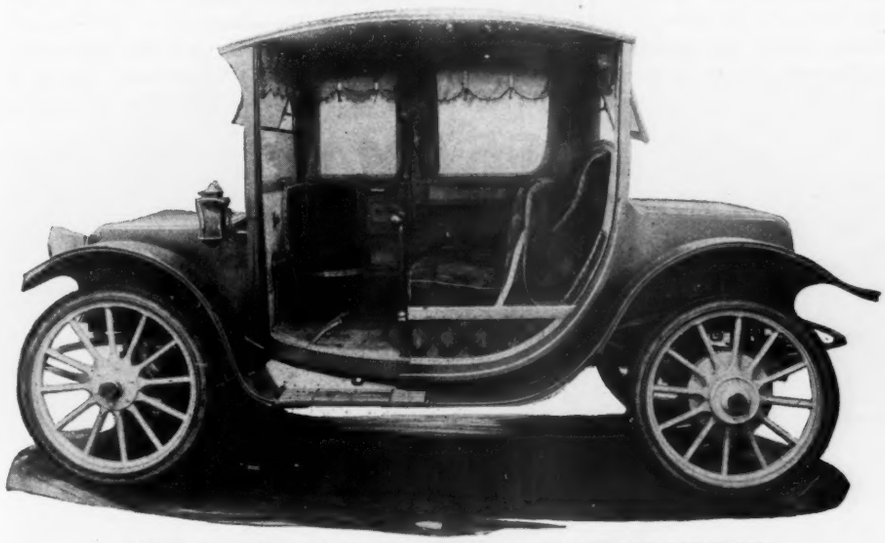
Saxon and Carnation Shown

The small car, too, had its surprise parties and for the first time the public has a chance to study the lines of the new Saxon. The Carnation, another Detroit product in the small car class, also is being displayed here. The Cameron, too, appears with a 30-horsepower creation.

Still another surprise comes in the shape of an Entz electric transmission, taken up by R. M. Owen & Co. of New York, a device that takes the place of the flywheel clutch, the gearset, electric starter and electric generator. This device was fitted to an Austrian-Daimler chassis.

Outside of the show there is plenty to keep the tradesmen busy for the rest of the week in the shape of meetings of the Society of Automobile Engineers and the Motor and Accessory Manufacturers. This is the annual meeting of the S. A. E. and according to the program outlined H. M. Leland of Detroit is to be chosen as president to succeed Howard Marmon.

The enthusiasm and interest displayed by visitors at the show on the opening afternoon and evening augers well for the prosperity of the motorcar industry during the present year. Exhibitors already are reporting advance orders and prospective purchasers were in the majority among the throngs of connoisseurs that packed the resplendent Grand Central Palace today. The local show will close January 10 with past attendance records broken.



NOVEL WAY OF SHOWING INTERIOR OF WAVERLEY ELECTRIC

Importers Display Foreign Cars at Hotel Astor

Ten European and Two American Makes Shown in Salon—Exhibition Gives Line on Body Styles for This Season—Accessories Given Space This Year

NEW YORK, Jan. 2—Today the Automobile Importers' Alliance, Inc., stole a march on the National Automobile Chamber of Commerce when it opened its tenth annual salon in the ball room of the Hotel Astor a day ahead of the national show. It will continue until January 10.

Ten foreign makes of cars are on display besides two American. France and Italy divide the honors for greatest representation with three well-known makers from each country, while Germany comes next with two concerns exhibiting and England and Belgium each have one representative. The foreigners are:

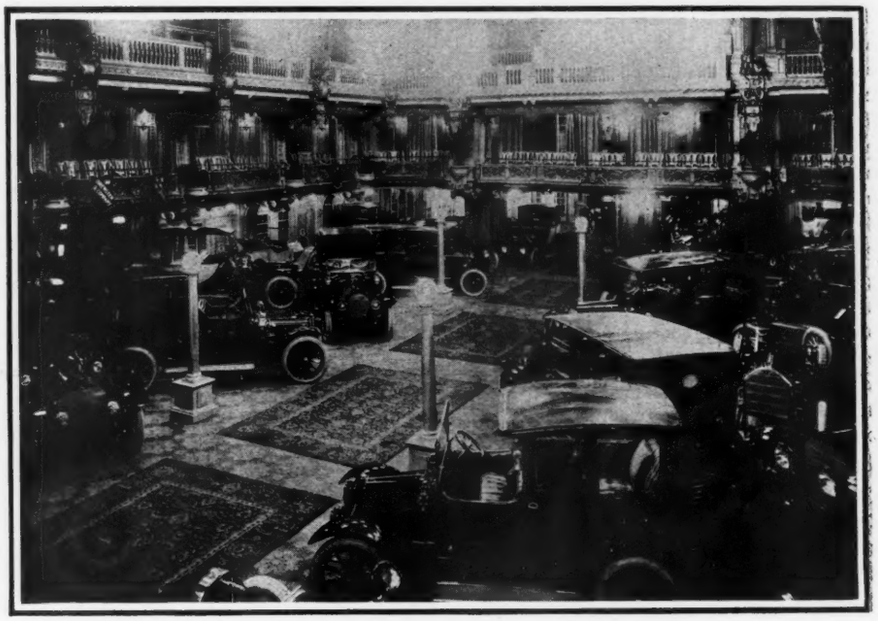
Bugatti, Ettore Bugatti, Molsheim, Elsass, Germany.
DeDion-Bouton, Etablissements de Dion Bouton, Puteaux, France.
Delaunay-Belleville, Automobiles Delaunay Belleville, St. Denis, France.
Fiat, Fabbrica Italiana Automobili Torino, Turin, Italy.
Isotta-Fraschini, Fabbrica Automobili Isotta Fraschini, Milano, Italy.
Lancia, Lancia & Co., Turin, Italy.
Mercedes, Daimler Motoren-Gesellschaft, Unterturkheim, Germany.
Minerva, Minerva Moteurs (Societe Anonyme), Antwerp, Belgium.
Peugeot, Peugeot & Co., Beaulieu, France.
Marshall-Arter, Marshall-Arter, Ltd., Hammersmith, England.

The Simplex and the S. G. V. are the two American cars at the luxurious show and their makers exhibit some interesting designs.

Foreign Tires Exhibited

For the first time, half a dozen accessories exhibits are here. These for the most part are foreign tire importations, namely, the Gaulois, Prowodnik and Faure, while the Dunlop tire and wire wheel also are to be seen as well as the newly imported Crown Prince steel wheel which hails from Germany. One accessory concern, the A. J. Picard Co., has an interesting and comprehensive showing of accessories for the motorist.

Two body builders are on hand, namely Holbrook and Brewster. The former was represented last year also, but Brewster, whose bodies are shown on the Delaunay-Belleville chassis, was not an exhibitor at the previous salon. Quinby, Locke and Healey who were in attendance last year are absent from the present exhibition, which is to be lamented, since the art of all of these special body builders always is of special interest.



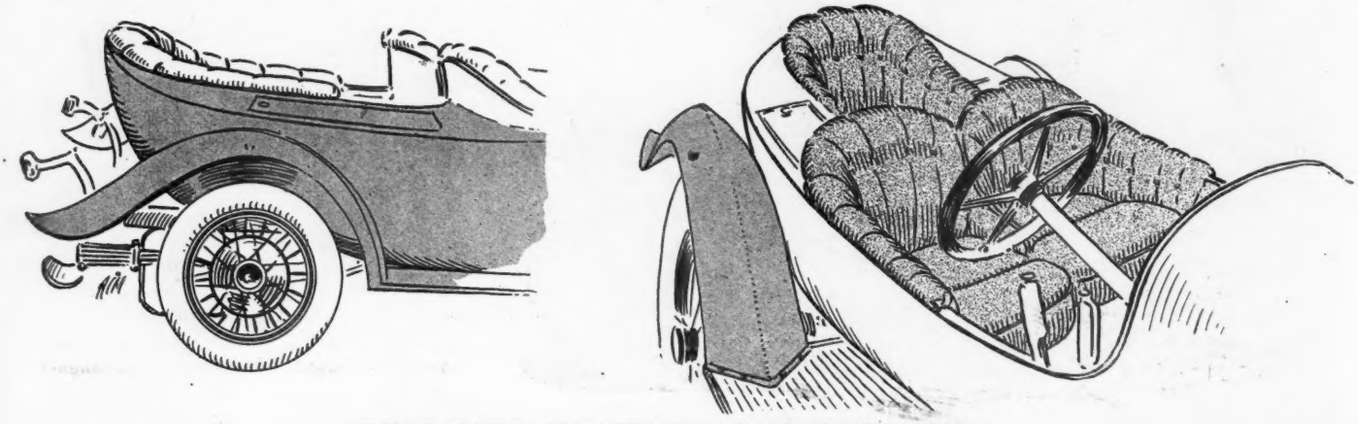
VIEW OF IMPORTERS' SALON IN HOTEL ASTOR

The missing names this year as compared with last among the car builders are the Renault, Panhard, Metallurgique, Austrian Daimler and the Canadian Keeton. The Peugeot, Delaunay-Belleville, Fiat, Bugatti, Marshall-Arter, Simplex and S. G. V. fill up the spaces vacated by the absentees and keep the list up to the proper total. The Austrian-Daimler is at the Palace.

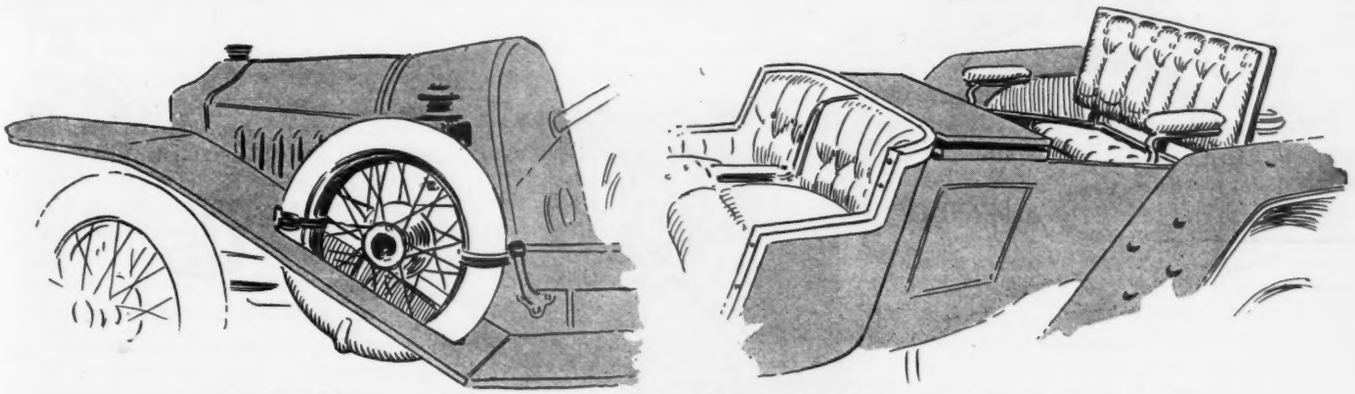
Novel Bodies Are Shown

Generally speaking, the importers' show is a body show, for it brings to light some of the novelties of the greatest of the body specialists of this country and abroad. Holbrook and Brewster are to be particularly congratulated this year on the originality of some of their designs.

The salon brings out forcibly the fact that the bodies fitted to these foreign chassis are ahead of the average American type in beauty of lines. Corners and edges have been subdued and moulded into complete wholes which for appearance cannot but be admired by the most critical. But in comparing these cars still further with the distinctively American car, it is at once evident that the American makers have outdistanced many of the salon exhibitors in the cleaning up of running boards and removing all obstructions to smooth lines from the exteriors. We see a beautifully, graceful body from one end to



UNIQUE SEATING ARRANGEMENTS OF THE BUGATTI MODELS



SPARE WHEEL IN FRONT FENDER AND DISAPPEARING SEATS OF DE DION-BOUTON

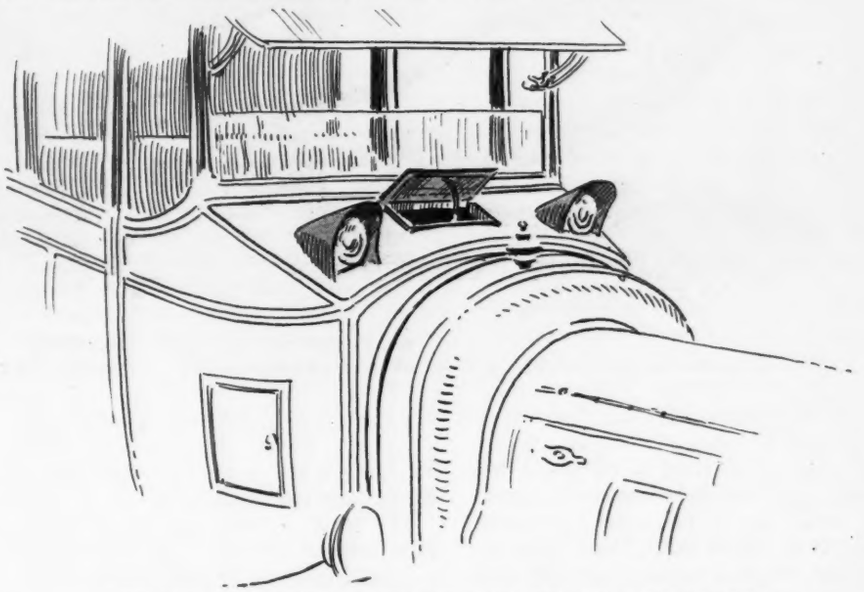
the other, but down on the running boards there are tool boxes and luggage carriers which detract.

Your American body builder, too, has advanced further in the removing of door handles and hinges from the outside of the body. On most of the foreign designs submitted for the approval of the fastidious American buyers there are the door handles and hinges sticking out as prominently as ever. The inside door handle, which is much more convenient to get at from within, is not yet a fixture with the European.

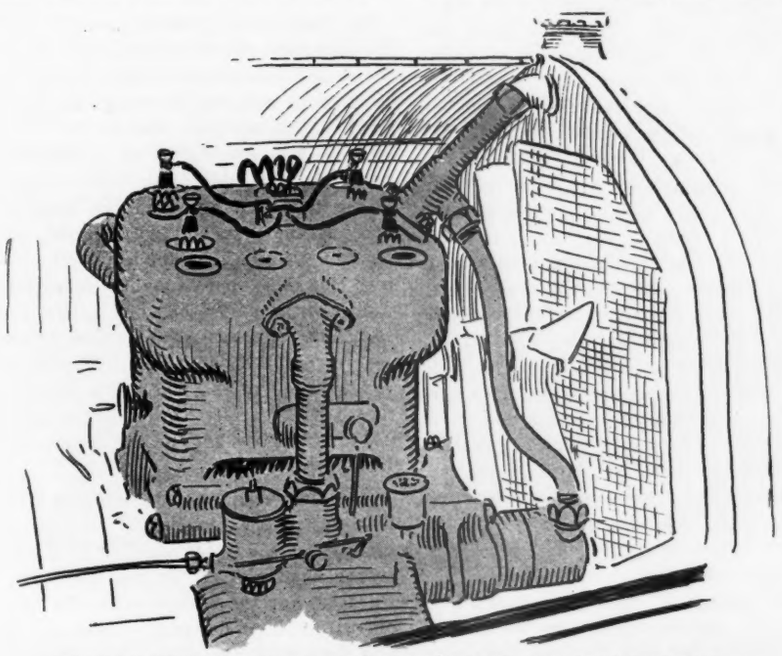
Carry Levers on Outside

It is hard to see, further, why some of the most striking bodies at the salon with their smooth sides and beautiful lines, should have the drive side marred by the placing of the gearshift lever and the brake lever outside. This is a fault in the chassis, of course, but with little alteration can be eliminated as a disturbing factor from the artistic standpoint. The American maker is about 2 years ahead in this respect.

The American public also is given an opportunity to study the light car of Europe at the salon. There are three examples of the little vehicles which are not cyclecars but especially designed small motor cars. The Baby Peugeot is on hand and looks the part of a little brother as compared with its companions of the same name. Then there is the Bugatti, designed by an Italian of that name but being manufactured in Germany. The third is the Marshall-Arter, treated in Motor Age a short time ago. This is an English light car and really is an assembled proposition, a product of a newly formed concern.



EYELASH LAMPS AND VENTILATOR OF DELAUNAY-BELLEVILLE

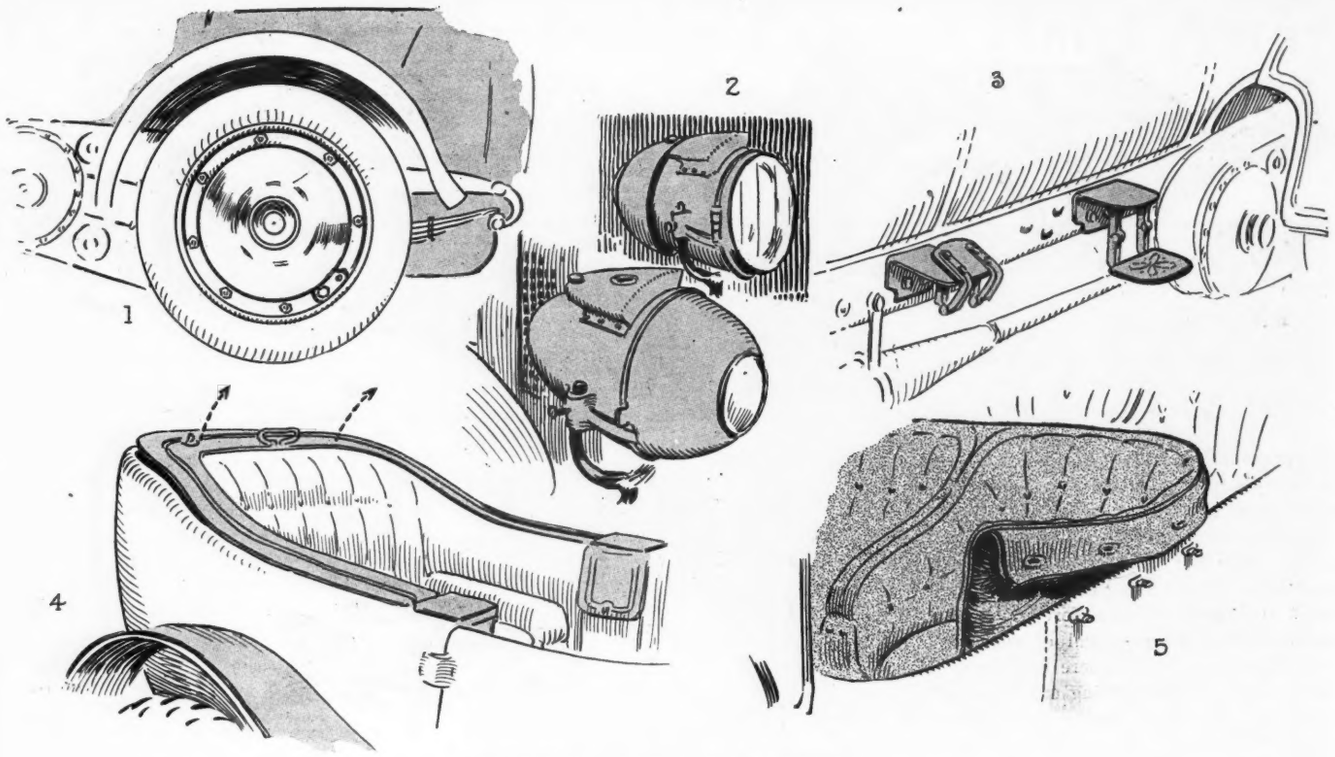


FOUR-CYLINDER, V-TYPE BLOCK-CAST ENGINE OF LION-PEUGEOT

Much interest among the visitors attaches to these three light cars. They have features which are not unlooked for by those who have delved into the small-car movement and show a lot of ingenuity in making room for the passengers, for the shifting of the gear lever and brake lever and for the securing of simple constructions in order to make manufacturing at a low figure feasible.

Details of Baby Peugeot

The Baby Peugeot is the smaller of the three and is a roadster with seats side by side. It has a wheelbase of 72 inches, a tread of 41 inches, and measures 96 inches in overall length and 50 inches in overall width. It sells for $975 in New York. The engine is a four-cylinder block, 2¼ by 3½ and has an approximate brake horsepower of 11. The front springs are of the conventional half elliptic type while the rears are reversed cantilevers. The change-speed mechanism is unique. There are three speeds forward and reverse, both second and third forward being direct drive.



FEATURES OF THE 1914 MERCEDES

1—Disk wheel of wood; 2—Type of exotic lamps; 3—Folding-up step; 4—Disappearing top with body; 5—Removable upholstery

There are two transmission shafts and both have a different bevel wheel meshing with two different crown gears. The change-speed therefore consists in connecting either one or the other transmission shaft to the clutch shaft. Both shafts are enclosed within a torque tube. This little car has an average speed record of 46 miles an hour for 168 miles.

The little Bugatti was introduced in Europe in 1910 and its seating arrangement is unique. The front seats are staggard. That is, the driver's seat is somewhat forward of that of the passenger's seat beside it, while back of these there is another seat which is surprisingly comfortable once the passenger has gotten into it. To give leg room in this rear seat, the floor here has been continued down. The body has somewhat of the lines of the new boat body type and rounds in at the rear. Fenders are unusual in that they have a V section, the crown part being over the wheels. This construction should eliminate much rattle.

Bugatti Motor Has Rotary Valves

The motor of the Bugatti is a block cast type, 65 by 100 millimeter, and has rotary valves. A shaft runs vertically up from connection with the crankshaft at the front of the cylinder block and bevels to a horizontal shaft running along the top of the cylinders. The rotary valves are below this latter shaft and get their rotation from it by worm gearing, being at right angles to the horizontal shaft. This construction is not new, but at least its adaptation to such a small power plant as this is commendable. Cantilever springs are used, the rear pair being reversed. The car has a four speed gearset and a shaft drive, and the wheelbase is 94½ inches. The price is set at $2,500 in this country.

Shows Only Car Chassis

The Marshall-Arter appears in chassis form only, so no idea of the body design or arrangement is afforded. This is unfortunate, for the public is especially interested in the dress of these small cars. The car has a French block motor, while the frame is made very light by the use of wood side members re-inforced with metal. The wheelbase is rather long, which no doubt admits of a roomy body, and with this length, the drive shaft must have considerable length to get back to the rear axle. This shaft passes back horizontally about half way. Here there is a special hanger hinged to a cross member which hanger carries a universal joint construction allowing for variations of the rear axle. The axle incorporates the gear change mechanism within it in a very neat and compact form.

Among the big cars, seven exhibit one or more chassis. In general these show that the European makers still adhere rigidly to the transmission brake construction in one form or another, besides putting brakes on the rear wheels. Two sets of brakes are thus to be regarded as a conventional feature of foreign car design. The Isotta-Fraschini has both front and rear wheel drum brakes besides the transmission brake and is the only car so equipped. The transmission brakes are often water-cooled.

Three makes of cars are chain-drive models and makers report that there is a great demand for this type of transmission. These are the Isotta, Mercedes and Simplex. In all cases the chains are well inclosed against dust and dirt and as a preventive of noise.

As is to be expected, all of the foreigners have right drive and control either in the center or on the right. Though practically every American car has reverted to the left drive, steering from this side is not favored in Europe. Accordingly, American makers who ship cars abroad have to provide them with right drive.

Exhibit Disappearing Tops

In bodies, the greatest novelty is that by Holbrook which is fitted to a de Dion 50 chassis and also to a Mercedes 60. This is the nearest thing in design to the boat body which has been seen in this country and has the new feature of a disappearing top. The top folds down into a recess between the back seat and the outer body wall at the rear and when down cannot be seen at all. The top supports also go into this recess out of sight. When raised, the cover is pulled out of its cavity and the front brought forward where it fastens securely to the windshield. The latter is rigidly fixed to the body with heavy side pieces which really are the front top supports as well. There are no braces at the front seat.

The Mercedes design is shown in a silver priming coat while the de Dion is completely finished in black. The body rounds to the hood and at the rear concaves inward toward the bottom after the fashion of certain boat designs. Doors are large and flush with the sides. The de Dion is

to sell for $7,000, while the body alone costs $2,000.

Mercedes also shows a speed car in white which has metal disks over the wheel spokes to give a racy touch. This is a sporting car, pure and simple, and has red leather upholstery which can be removed entirely. There also are several other special features of this car such as the steps which fold up out of the way to give greater road clearance, though allowing an easy step into the vehicle when down.

Convertible Cars in Evidence

Convertible cars are more in evidence at the salon this year. Mercedes has a striking example of what can be done along this line. The body is a Holbrook design and may be converted into either an open car or a completely inclosed limousine with separate forward and rear compartments if desired. The car is a dark green, and the cloth upholstery within is made to match. By dropping the window between front and rear seats and folding down the side windows, the car is completely open to the outside and to the front. The top may also be lowered.

There are two cars exhibiting with Knight type of motors this year. These are Minerva which has only engines of this type and Mercedes which offers a 45-horsepower Knight only. The others of the Mercedes name are poppets.

The wire wheel on the foreign cars seems to have lost some of its sway, as a goodly number of them are shown with wood wheels. This may be due to the fact that the foreigners have equipped these cars for American trade with wood wheels thinking to meet the demand here better, or it may be due to an actual slump in the popularity of the wheel which certainly is fast gaining ground among domestic makers.

Disappearing rear seats are very popular on many of the new designs submitted at the salon. In this construction, the vehicle is to all intents and purposes a roadster with a sloping rear deck. But the deck hinges upward at the back and part of the top of it makes the back of the extra seat. Then to give enough room, another door in this deck hinges the other way in many designs, leaving an opening plenty large for entrance and egress from this rear compartment. Such a car gives the advantage of a classy roadster besides affording seating for one or two passengers in emergencies. This extra seat construction either is of the single form or it may be had as a double affair for two persons. De Dion shows a special roadster of the speed type, having a rear double seat which folds up flush with the rear deck, while Minerva also has a beautiful roadster in black with a single disappearing rear seat. None the less attractive in line and method of working out of the constructional details are these special seats in roadsters exhibited by Isotta, Peugeot, and S. G. V.

Brewster Bodies Unique

Exceedingly distinctive bodies are those of Brewster make fitted to the Delaunay-Belleville chassis, the Brewster people being the agents in this country for these French cars. In two of these of closed type there are no doors to the compartment for the driver. This admits of more graceful and distinctive outlines to the coach part proper and is really a reversion to older design. One specially attractive limousine by Brewster has much the same lines as the old coach—not the colonial type but one which we are accustomed to associate with even earlier times.

The small town car with narrow rear seat for not more than two persons also is on hand and is designed as a milady's town car. Usually it has no extra seats within, and the narrow rear admits of graceful lines. Lancia and Delaunay-Belleville have specially attractive models of this form.

Lancia models have very wide doors for entrance to both compartments of the open models. These measure about 28 inches across. Such width is not necessary for the front doors of course, but to conform they are made the same as the tonneau ones, leaving much of the front seat exposed when they are opened.

Coach work of the Lancias also is noteworthy in the use of wood inlaid panels on the doors within for both open and closed models. De Dion also has a limousine with very fine interior wood work panels. This body was made by Moore & Munger. The panels are wide and very elaborately inlaid.

Minerva and Isotta Attractive

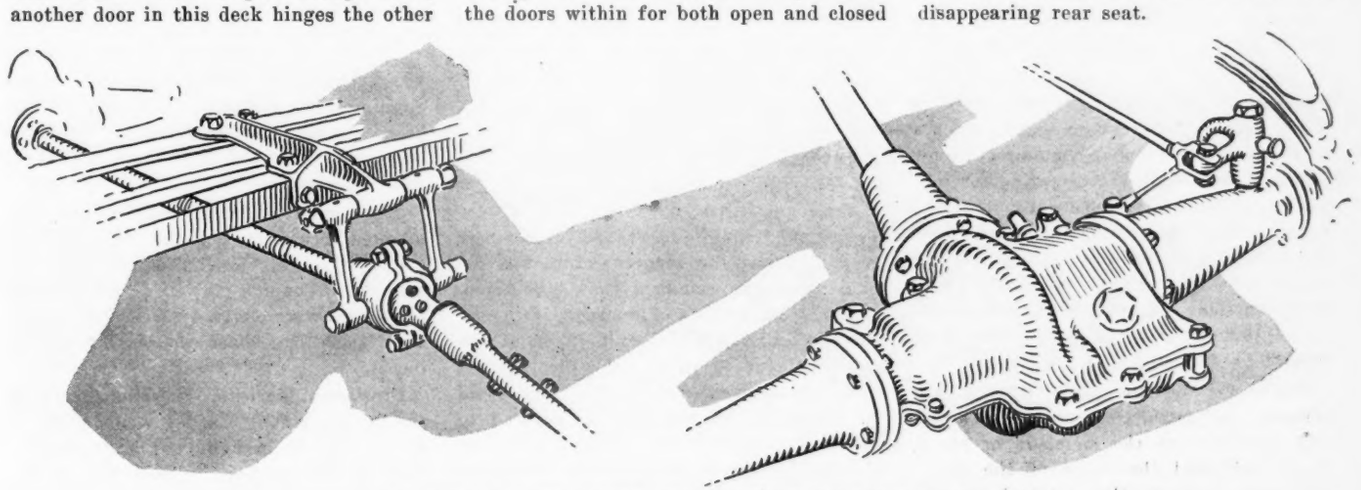
The Minervas are exceedingly beautiful with D'Eiteren bodies. A cabriolet on an 18 chassis, a roadster on a 26 and a closed car on a 38 are exhibited. Isotta also shows some excellent bodies. A 120-130-horsepower chassis carries a special roadster in light yellow, while one of the lesser-powered chassis is fitted with a touring car body of sloping hood and cowl design.

Fiat also appears with some unusual refinement of body work. A Holbrook limousine mounted on the 30-20 chassis features the exhibit, although two beautiful open cars are on hand.

Besides its regular line of models, Peugeot imported for the salon this year two examples of its Lion type of cars. These have four-cylinder V motors, the cylinders being cast in a nearly square block. They have cowl gasoline tanks and are much lighter in weight. The Lion type is new to this country in a four-cylinder form. The selling price of this model is $2,850.

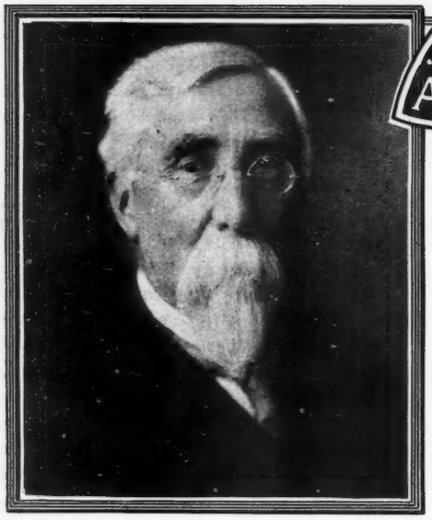
Simplex has two chassis on show besides two touring models and two town cars. These are most attractive and up to the minute. One of the touring models has a divided rear seat which though limiting the passenger-carrying of the rear makes a very comfortable proposition for the occupants.

S. G. V. had one novelty which is exclusive with it so far as the salon is concerned. This is a cabriolet with a glass front of V-shape. There really are two sets of windows to this, one on the driver's side and one on the side opposite. This design presents a pleasing appearance, and the sloping lines given by the glass part are carried out in the hood slope and radiator pointing. The entire top with the exception of the V-portion folds back so as to open the car if desired. A dome light is fixed in the center of the ceiling of the stationery V portion. S. G. V. also has an attractive model with disappearing rear seat.



MARSHALL-ARTER DRIVE AND GEARBOX ON REAR AXLE

The S. A. E.'s Annual Meeting



H. M. LELAND, NEW PRESIDENT OF S. A. E.

H. M. Leland Succeeds Howard Marmon as President—European Trip Proposed—Papers Read and Discussed

HOWARD MARMON, RETIRING PRESIDENT

NEW YORK, Jan. 6—H. M. Leland, the father of the Cadillac plant, succeeds Howard Marmon as president of the Society of Automobile Engineers. The other officers elected today were: Treasurer, Hermann F. Cuntz, succeeding himself; first vice-president, W. G. Wall, succeeding J. G. Perrin; second vice-president, K. W. Zimmerschied, succeeding Russell Huff. The counsellors are Henry C. Wilson and Christin Girl. Croker F. Clarkson remains as secretary and general manager.

S. A. E.'s Annual Meeting

The annual meeting of the Society of Automobile Engineers opened Sunday with a reception at the Manhattan Automobile Club. Monday saw a meeting of the standards committee at which the reports of the various divisions were made ready for the general meeting. The real work of the society commenced this morning with the first professional session, which was opened by the address of the then president, Marmon, following which the reports of the various divisions of the standards committee were read.

President Marmon opened with an address on the progress of the work of the society. The keynote was the necessity of more frequent committee meetings. He spoke of the necessity for having more money to meet the increased expense due to holding more of these meetings and stated that he hoped by the end of another year that the society would have outside sources of income which would enable the expenses of these meetings to be defrayed.

President Marmon described the last summer session as a success, stating that "the presence of the members of the I. A. E. enhanced the value of the trip." The only criticism that he had to offer was the fact that the membership hall was too small to adequately meet the needs of the society. For the coming summer it has been planned to hold the session at Cape May, where greater facilities will be offered.

Messrs. Kennedy, Moscovics and Anglada were appointed to count the ballots for the election of officers.

Hermann F. Cuntz read the treasurer's report, which showed the society to be in a prosperous condition. At the close of the fiscal year, October 1, 1913, the cash on hand amounted to $5,273.35, as compared with a few hundred dollars the year before. Mr. Cuntz stated that conservatism in expenses has been the keynote of the policy of the society and for that reason the growth in the expenses has not been commensurate with the growth of the work.

Coker Clarkson, general manager, read a report on the growth of the membership of the society. There have been 184 new members elected.

Arthur B. Cumner read a report of his investigations in securing data on the cost of making a trip to Europe to return the visit of the I. A. E. and to make several other points of interest. The suggested trip requires 39 days, sailing from New York for Paris on October 10 and then including in the itinerary Turin, Stuttgart, Berlin, Frankfort, Cologne, Essen, Brussels, Antwerp and a number of other points, reaching London in time for the Olympia show, which will run from November 6 to 14.

Regarding the cost of making the trip, Mr. Cumner has figured that the entire trip could be made at the inclusive figure of $550 per person.

President Marmon stated that he believed the required seventy-five members would be easy to secure and it was decided that the members should be circularized with an idea of finding within reasonable limits the number of persons who could be counted on to make the trip. It also was suggested that the trip could be shortened by anyone who desired to economize on time by either eliminating the Berlin trip or cutting down the time in Paris and London.

At the close of the discussion the report of the ball and roller bearings division was submitted by its chairman, B. D. Gray, of the Hess-Bright Mfg. Co. In submitting the report it was stated that since the meeting of the committee last June it was found that the tolerances first adopted last June were too close to be practical. The tolerance of .0002 inch was commercially impracticable because this narrow limit made the prices of the small bearings out of proportion with those of the large bearings on account of the greater amount of hand labor entailed on the small ones.

Discussion on Bearings

Mr. Gray called attention to the fact that the tolerances for the bore of the races are wider than those absolutely necessary, but this is done to let all manufacturers in it and they are greater than are usually found in the bearings as delivered from the makers. Eccentric tolerances had been said to be too wide, but it was found that 75 per cent of the bearings are well within the tolerances given. It was stated that the idea all along was to get commercially practicable tolerances. Where closer limits were needed they should be specified as desired.

It was brought out that a new definition for eccentricity had been adopted by the division; this definition is as follows: "The eccentricity of the inner race is that lack of running truth noticed upon the stationary outer race when rotating the inner race balls upon two centers. The eccentricity of the outer race is that running truth shown up in a suitable indicator showing the rotation of the outer race and balls upon the inner race fixed upon a stationary arbor."

This definition, Mr. Gray stated, was adopted because it follows the method employed in all testing departments for bearings. The end play or actual freedom tolerances were omitted because at present no methods have been devised for measuring it.

President Marmon, in commenting on the report, stated that he was pleased to know that it brought out the practical side of the question. There was no discussion.

The report of the data sheet division created a great deal of interest and was presented by B. D. Gray, chairman of this division as well. He said:

When your present committee undertook its labors several weeks ago, it was confronted by a large accumulation of material, much of which had lain dormant for more than twelve months.

A considerable portion of this material has already been put into data sheet form; a few sheets are ready for distribution and a number of others are in the hands of the printer. A few of the subjects under consideration delve deeply into higher mathematics, and some are closely allied with the specific work of other divisions of the standards committee. In the latter case it has been deemed advisable to refer such matters to the various divisions directly concerned for approval, and in the former, to take sufficient time for a thorough analysis before printing. In this way we hope to select only such material as will be of real value to the members.

It shall be our aim primarily to render available to the members such data as are in most general demand, amplifying with more specific motor car engineering data as promptly as obtained. In the latter class will be included such reports, or portions of reports, of other divisions, as may be conveniently reduced to data sheet form. We hope ultimately to make the data book so comprehensive that it will practically supplant all other hand books in the engineering library.

Preparatory to the compilation of a large mass of data, and with a view to condensing it as much as possible, we have adopted the plan of printing sheets on both sides where the subject treated occupies more than one page. Different subjects will be kept separate, however, until revision has become very infrequent, and the book has assumed such proportions as to render advisable its being bound in permanent form. With a view to further economizing space and at the same time increasing the value of the data sheets, we find it advisable to revise some of the existing tables. In accordance with suggestions made at the June, 1912, meeting, we will give the authority in the case of new material, with reference to the publication from which it has been taken. Sheets will also be dated in future, to avoid confusion in the event of their being superseded.

Upon the recommendation of Mr. Souther, we have postponed printing the last report of the iron and steel division until such time as more specific physical properties of the various alloys, when subjected to certain heat treatments, can be determined. We also have delayed printing the last report of the ball and roller bearings division owing to the fact that a further report on tolerance was to be submitted at this meeting. Immediately upon its acceptance by the society, this report will be prepared in data sheet form.

In commenting upon this, Gray stated that he believed that if motor car engineers had one book giving all the data needed for his work that book would become his bible. And it is the intention of this division to compile a data book which will be the engineer's bible. He called for assistance from the members in general in the compilation of the data book as he was convinced that most of the members have much valuable data which has been developed in their work or which they have come across accidentally and that they owe it to the society to contribute this. It was his earnest appeal to assist in the production of a work which would be a monument to the society.

In opening the discussion President Marmon suggested that the trade periodicals which annually issue specifications of the cars on the market reprint them in data sheet form for the data book. He stated that the valuable material contained in these large issues usually was unavailable when needed because the bulky volume was mislaid.

Another Meeting to be Called

To acquaint the manufacturers with the importance of these data sheets it was suggested that a paper be presented on the subject at the summer meeting. Mr. Gray stated that he had in mind the publication of some of the data on blueprint paper for draftsmen's tables to be supplied at extra charge to non-members.

The nomenclature report was not presented. In commenting upon it President Marmon mentioned the wail he has heard from his factory for definite names of parts of the motor car.

Routine of Winter Session of S. A. E.

Papers Read and the Discussions

NEW YORK, Jan. 5—Today started the real activities of the winter session of the Society of Automobile Engineers. The program called for a meeting of the standards committee as a whole and at this meeting the different reports of the divisions were read and discussed preliminary to presenting them for acceptance before the general meeting of the society to be held at the Automobile Club of America, tomorrow and Thursday. The net result of the work is as follows:

Ball and roller bearings division report to be submitted to general meeting. No discussion took place on this report, which was read by Howard Marmon.

Electrical equipment division report to be presented at general meeting. The discussion on this report brought out the fact that the report is so designed as to take care of all batteries regardless of the number of cells of which they are composed. Should higher voltage lamps than the 6-volt type be used this will not affect the results attained by the standards committee since the specifications are given on a per-cell basis. A digest of the electrical division report follows:

The following practices are recommended: Electrical apparatus for use on gasoline motor cars, when operated on circuits of from 6 to 25 volts, shall be capable after installation of withstanding for 1 minute an alternating potential of 500 volts, the test being applied between the conducting circuit and frame or ground. In the case of apparatus with one terminal grounded, the ground connection shall be removed at such a point as will permit the test being applied to all parts of the circuit which, in actual use, will be subjected to working potential.

Exception.—Batteries will not be subjected to any insulation test above their working potential.

The overall width of the battery, measured from side to side of case, shall not exceed 7½ inches.

The overall height of the battery measured from bottom of case to top of handles shall not exceed 9½ inches.

The overall length of the battery, measured from end to end of case, including handles, shall vary according to the capacity of the battery and its details of design. Han-

THE NEW PILOT COMES ABOARD

dles shall, as standard, be placed at the ends of the battery, and provision for hold-down devices shall, as standard, be made at the ends of the battery. The space occupied by such handles and hold-down devices shall be in the direction of the length of the battery only, and not in the direction of its width. Terminals and connections shall not extend above the handles; the latter to be the higher point.

The broaches division report, which was read by C. W. Spicer, the chairman of this division, brought out some little discussion on the changes which have been made in these specifications. It was pointed out that it is unnecessary to put a radius on the outer edge of the broach tooth and that furthermore the manufacturing costs of so doing are prohibitive.

Report of Broaches Division

In comparing the work of the committee with the previous tables drawn up, it was shown that the tables had to be altogether changed to meet the condition of taking the nominal diameter as the measurement across the splines. The report follows:

Within the last year or slightly more, the matter of applying a hobbing machine to multiple-spline shafts has come to the front for serious attention. It appears to be definitely determined that especially for six or more splines the hobbing process is an important step in advance from the commercial production standpoint; and the importance increases with the number of splines. It therefore seems wise that this feature should be taken into consideration when studying any new data on the subject of multiple splines.

It appears from careful study that some proportions of multiple-spline shafts now in use can have the splines developed by the hobbing process, whereas other forms also in use cannot be developed by that method. It seems therefore that any recommendation as to accepted practice or standards should be such as to permit of manufacture by the hobbing process.

The standards committee recommendations were as follows:

(1) That in the six-spline shaft the splines and grooves should be as nearly as possible of equal width—that is, the outside circumference of the six-spline shaft should be spaced into twelve approximately equally divided divisions.

(2) The design should be such that so far as possible the same broaches can be used for developing different required depths of splines.

(3) That the nominal diameter in all cases be taken as the outer diameter of the shaft.

The miscellaneous division had reports on six subjects. These were dimensions for mechanically-driven air pumps, cotter pin sizes for S. A. E. rods and yoke ends, S. A. E. spark plugs, drawing standardization, license pads and lubricating oils. Arthur Holmes, chairman of the division, reported that the work on drawing standardization, and lubricating oils and not been carried far enough to make a report and this was referred back to the division along with the work on uniform license pads.

Addition to Pump Report

The reports on mechanically-driven air pumps, cotter pin sizes and spark plugs is reported up to the society as a whole and will be taken up at the meeting. Some additions were made to the pump report in which the length of the base parallel to the crankshaft was given as 3.75 inches. This was modified to include the words for two and four-cylinder pumps. In general the pump dimensions given in the following report are larger than those in general use.

Dimensions of mechanically-driven air pumps for motor cars recommended are:

Shaft diameter	1"
Width of base (right angle to crankshaft	4½"
Length of base (parallel to crankshaft)	3¾"
Distance from center of front base-plate holes to shoulder of shaft	1¾"
Distance between centers of base-plate holes—	
At right angle to crankshaft	3¾"
Parallel to crankshaft	3"
Base-plate hole thread	⅜-16 U.S.S.
Dowels, two	¼"

3¾" c to c, each placed midway between pair of base-plate holes located on each side of crankshaft.

Cotter pin sizes for S. A. E. rod and yoke ends were accepted as given in the following report and were put up to the general meeting.

Rod and yoke end size: $\frac{3}{16}$ inch, ¼ inch, $\frac{5}{16}$ inch, ⅜ inch, $\frac{7}{16}$ inch, ½ inch.

Diameter of cotter pin: $\frac{1}{16}$ inch, $\frac{1}{16}$ inch, $\frac{3}{32}$ inch, $\frac{3}{32}$ inch, $\frac{3}{32}$ inch, ⅛ inch.

An interesting point was made on the spark plug discussion when it was stated that there are only two companies that are conforming to the dimensions as laid down in the previous recommendation of the spark plug division. The following report was put up to the general meeting with the alteration giving the bottom diameter of the recess adjacent to the flange as equal to the core diameter of the thread instead of .75 inch. The following practices are recommended: The spark plug shell shall have a ⅞-inch diameter, straight thread, 18 pitch, and dimensions shown on the following drawings and specifications:

Stock—1⅛" across flats hexagon.

Flange form—Circular; diameter, 1⅛"; thickness, $\frac{1}{16}$"; face, annular seat ⅛" wide (suitable for copper asbestos gasket).

Blank for thread—Diameter, ⅞"; length, ½" (including recess).

Recess adjacent to flange—Width, ⅛"; bottom diameter, ¾". Diameter at flange to be same as outside thread diameter, for the purpose of centering gasket.

Thread diameter—⅞" straight (tolerance from precise measurement of thread diameter: plus, 0; minus 0.003"); pitch, 18; form, U. S. standard; cut, perfect into recess and cuff.

Cuff—Extension of spark plug shell below threaded portion shall be known as cuff. Cuff shall be cylindrical in shape and the outside and inside edges of the same shall be chamfered. Length, 3/32"; diameter, .750".

Standards Committee Report

The report of the motor testing division was read by the chairman, J. O. Heinze. He submitted three form sheets 8.5 by 11 inches in size, the first of which is in the form of a blank to be filled in with motor and motor accessory specifications. The second sheet is ruled for the plotting of the horsepower and other curves and the third sheet is for the tabulation of the data shown on the curves.

Discussion developed the fact that there is a fear of getting too much complication in these sheets and that the maker of motors would not use all the information for which space was provided.

Herbert Chase suggested a change of wording to read total piston displacement instead of piston displacement and clearance instead of compression space. He also pointed out that the desirable arm length on the dynamometer is 63.0252 inches instead of 63.21. Mr. Lloyd suggested an additional sheet upon which research data could be entered if desired.

Nothing was done on the nomenclature division on account of the absence of its chairman, E. J. Stoddard. The report was referred back for report at a later meeting.

The pleasure car wheel division report was read by Henry Souther, chairman, and it was pointed out that while much progress had been made it was advisable to refer the matter back to the division. Several points have been learned, the most valuable of which is that the bursting tests are not as valuable as the permanent set and deflection tests on the rims. The matter will come up at the summer meeting of the society.

The springs division has prepared a paper which will be presented at the S. A. E. meeting by Chairman H. L. Pope.

Report of Trucks Standard Division

The truck standards division report showed considerable progress in the way of wheel diameters and the discussion showed a practical unanimity of opinion on the recommendations as far as they went. W. P. Kennedy, chairman of the division reported that only one recommendation was ready to be presented at the coming meeting and that was to reduce the future truck wheel equipment to two, having nominal diameter of 36 and 34 inches. After considerable discussion whether or not this met the requirements it was decided to change the recommendation to read three sizes, 36, 34 and 32 inches. Evidence taken from reports by tire companies on this matter showed that only about 1 per cent of the tires turned out are of the 32-inch size but that there is a great tendency to build trucks in the 1,000-pound class that will require that size of tire.

Although the truck standards division has had under consideration several projected possibilities for recommended practice, it is prepared to offer at this meeting only one recommendation on wheel diameters, as follows:

"That the varieties of wheel diameters in the future equipment of motor trucks be reduced to two, having nominal diameters of 36 and 40 inches."

The motives prompting this recommendation are fundamentally economic, based upon the substantial reduction to be effected in tire, wheel and vehicle cost, as well as the collateral reduction in operation cost, as made evident by our investigations. We believe that the commercial advantages to be derived by those at interest in exploiting motor truck application, are of such value as to warrant any compromise of an engineering character which may be involved in compliance with the practice recommended.

It may become advisable to add to these sizes another, probably 32-inch, diameter, but a review of current practice does not indicate any special demand for this at the moment, and we are of the belief that the present large employment of 34-inch diameter is principally influenced by cost, and that with the antiquated lowering of cost resulting from the recommended practice the 36-inch will be employed by preference.

We also propose to recommend later the adherence to two diameters, possibly 16 and 20 inches, in industrial truck equipment, and further hope to determine upon the limitation of sizes employed with motor fire apparatus.

Data Sheet Division Report

The data sheet division reported that having only had the matter in hand a few weeks that they were not ready as yet to give full results of their work. There are a number of sheets about to be issued and a vast amount of material is on hand from which other sheets will be evolved. It is

now practically a year since active work has been done along these lines but it is promised that the present activities will result in an early issuance of more of the sheets.

The report of the S. A. E. wheel tolerance was in the form of a communication from J. E. Hale, who stated that he found that there was a great tendency to use the tolerances specified under the former practice than to use the closer limits to which the present S. A. E. rule holds. Examination of wheels by Mr. Hale showed that many are from .375 to .625 inch out of round and that in many cases the wood rim and the felloe band were not flush. He states that the makers have changed back to the original specifications because of the extra cost of machining due to working to closer limits.

The Firestone company reported that the bevelled edge on the present rim is not needed and that only one tire company made any use of it. This was corroborated by representatives of other tire concerns which led to the tentative suggestion that the present standards be adhered to as far as tolerances are concerned, but that the bevelled edge be omitted.

The sheet metal report was read by Mr. Buckwalter, who reported that there was an almost unbelievable number of sheet thicknesses used in all kinds of work and that the manufacturers did not seem enthusiastic about standardizing. He mentioned that the Westinghouse company finds 872 thicknesses of sheet metal standard in their stores department. The matter was referred back to the division for further study.

The report of the electrical equipment division was read. The leading comment was whether or not specifications standardized by S. A. E. should not be identical with those presented by I. A. E. E. The meetings of the electrical equipment division had been attended by representatives of the British society. The latter is in accord with the recommendations.

Alden L. McMurtry stated that these recommendations appeared at an opportune time because of poor insulating jobs on many of the accessories now on the market.

The heading on rating data was changed to read lead batteries instead of merely batteries, as the specifications did not fit Edison. McMurtry stated the committee liked the single-wire system but that it was afraid of it. It is a matter of importance as there are many dealers who carry a stock of both single- and double-wire lamps in stock and thus are placed at disadvantage.

W. G. Wall favored the two-wire system, giving as a reason Mr. McMurtry's statement that as the insulation work on small accessories is poor, damage can be done if the two-wire system is used.

A motion was carried to have the standards committee get out a standard basis for lamps.

Digest of Some of the S. A. E. Papers

Engineers Listen and Comment

AN interesting paper was read by B. B. Bachman, assistant engineer of the Autocar Co., Ardmore, Pa., on the double-reduction live axle. His paper dealt with the axle built by the Autocar company and also with the advantages and disadvantages of the various types of final drive where a high reduction was desired. In discussing spur bevel type reduction such as is used on the Autocar, Mr. Bachman said, in part:

"The primary reduction which is 1.78 to 1, is in the bevel-gear set. The secondary reduction of 4 to 1 is in the spur-gear set. This arrangement offers several very desirable advantages. In the first place it admits of obtaining a straight-line drive by placing the spur pinion above the gear. This is an especially valuable feature where it is necessary to mount the motor high in the chassis to escape front axle interference.

A Second Advantage

The second advantage is that with the relatively small bevel gears, these parts are much easier to manufacture than they would be were the ratio greater. At the same time, due to the fact that they are not working under as high torque values as the secondary set, the thrust of the gears is easier to provide for. For the same reason the bevel gears with their weaker tooth forms are working under the most favorable conditions. Conversely, the spur gears are better able to take care of the high torque values of the secondary reduction, and the differential carrier bearings are relieved of the high thrust load which they would be required to bear if bevel gears were used."

Mr. Bachman then took up the relative advantages of the different types.

"Comparisons of constructions should be based on simplicity, cost, weight and efficiency," he said. "The constructions in use are the single-reduction bevel-gear type, the internal gear and the chain drive. The single-reduction bevel gear type is applicable only to light service, where low reductions are not necessary, for the obvious reason of the size of gear and housing necessary to obtain reductions greater than 4, or at most 5 to 1; the need therefore not be considered.

"From the standpoint of simplicity we must take into consideration first the amount of knowledge possessed by the public of the elements of the construction. From this point of view, the construction is superior to the worm gear type. The second point is the number of parts used, and on this point the worm gear has the advantage with the double-reduction form second, the internal drive third and the chain drive last. Accessibility should also be considered under this head, and here the unhoused chain offers an advantage if one is willing to allow working parts to be exposed to dirt, and to have no adequate lubrication means provided. If the chains are covered, it seems that all the forms under discussion are about on a par.

"Considering the relative weight of those different types, it would appear that that is not wide variation probable, or construction of equal capacities and refinement. As to efficiency we have to consider not only the performance in the testing laboratory but the ability of the unit to hold that efficiency under everyday service."

John Younger, engineer of the truck department of the Pierce-Arrow Motor Car Co. presented a paper on worm-drive axles. Mr. Younger first traced the development of this type of drive from the time it was first brought out for truck use by John Dennis in 1903 down to the present time, and then he brought out some practical points concerning the modern axles with special reference to the one used on the Pierce-Arrow. On the interesting but much disputed question of efficiency he said in part:

"Various and varied experiments have shown me that for all practical purposes it may safely be taken as being in the neighborhood of 95 per cent under normal conditions.

"Worm-gear truck manufacturers are constantly asked if their truck can climb hills, or, conversely, coast down them. A worm gearing that came into my experience had a reduction of 13⅓ to 1, with the angle of lead as low as 19 degrees, 47 minutes. This gear coasted quite freely, I am told and quite believe that worm gears with even smaller angles than this have coasted all right.

Flexibility of Design

"This brings us at once to the consideration of flexibility of design. For example, reduction ratios of 6 to 1 for fire engine work, and 12⅓ to 1 for agricultural work, have been used in the one housing."

Mr. Younger then discussed the wear and adjustment phases of the worm drive: Owing to the straight line contact wear takes place very evenly and uniformly; and the gearing retains its efficiency till worn out. Because also of this contact, a slight variation in the center distances does not materially affect the running of the gears, except to produce rather more or less backlash.

It also is evident that with a slight excess in the length of the worm, it can be slid axially along the wheel without any misalignment occurring. The worm should be in as perfect an adjustment as possible in the center of the worm wheel axis. This naturally makes an exceedingly simple assembling process, compared with the three plane alignment necessary in bevel gearing.

Worm gearing is and wears very silently.

Concerning lubrication, Mr. Younger said: Various lubricants have been used; ordinary transmission grease is fairly satisfactory, but the best results are obtained from the gears in a bath of oil like the Standard Oil Co.'s 600 W heavy cylinder oil.

From the user's point of view, the advantages are manifold. The housing is filled with a charge of oil which lasts up to 5,000 miles, during which time, all parts are freely lubricated, perfectly inclosed, and free from the wear caused by the admission of dust, dirt or grit or other abrasive substances. Contrast that with the care and labor that have to be expended in keeping chains and other uninclosed mechanisms in good condition.

Pleas for Fuel Investigation

H. G. Chatain, General Electric Co., made a plea for the investigation of the fuel question and advocated drawing specifications for purchasing fuel, stating that the Baume scale was totally unreliable as a guide. He also showed that the best fuel could be obtained by certain specifications at less cost than nondescript gasolines obtained under the present system. Incidentally he stated that benzole fulfills the requirements and mentioned an American factory which is in position to produce benzole in quantities. Commenting on this, President Marmon ventured that if drawing up a set of specifications would save 2 or 3 cents a gallon on fuel it was worthy of the society's efforts.

In the discussion of the paper on motor car effectiveness by David L. Gallup, professor of gas engineering at the Worcester Polytechnic Institute, the consensus of opinion was that the use of a greater number of speed changes permitted the employment of smaller motors and obtaining better economy. Herbert Chase, of the A. C. A. testing laboratories, stated that an engine was 50 per cent more efficient running on full throttle than on less than half throttle.

The report of the committee on wheel sizes was accepted.

Final drive for motor trucks was introduced by Arthur J. Slade, consulting engineer, with special papers as follows: Internal gear drive, by V. V. Torbenson, Torbenson Gear and Axle Co.; double reduction live axle, by B. B. Bachman, Autocar Co.; worm gear, by John Younger, Pierce-Arrow Motor Car Co., and chain drive, by H. D. Church, Packard Motor Car Co.

This evolved spirited discussion, Frank Burgess, Boston Gear Works, talking on the advantages of the worm as a whole and the Hindley type in particular. He stated the efficiency of the worm made it the coming drive and general adoption only a matter of development. The fact that electric pleasure vehicles adopt the worm shows lightness and efficiency, he said. He stated his conviction that the worm is the future drive for power in general and to support this pointed to the locomotives on the Panama canal. He stated that the success of the bevel drive was due to the excellence of the ball bearings.

Meyer states that his tests show the efficiency of double-chain drive to be underrated; this was as high as 80 per cent.

Mr. Alden, of the Timkin-Detroit Axle Co., stated that since his company started offering worms for trucks, the worm was putting the chain on the shelf in the classes where an option was offered. He said there was very little difference in comparative weights but under 2 tons capacity the advantage is in favor of the worm. The worm would be cheaper than the double chain when the volume of business became the same. He took exception to the statement made by Burgess in regard to the influence of ball bearings on bevel drive development.

In reply to the question as to how whipping of the shaft with worm drive was obviated in Pierce-Arrow trucks, Younger stated that a third universal divided the shaft into two parts.

President Marmon introduced an added topic in life-saving fenders for commercial vehicles and John Younger, Pierce-Arrow Co., mentioned the importance of the society seeing that a good job is done. He spoke of present legislation in Detroit, Chicago and Cleveland as examples of rash laws.

Treasurer Cuntz announced that the historical committee has received two endowments of $100 each to gather relics of the motor industry and place them in a museum. It is planned to carry this work to a point where a highly creditable museum will be formed. The paper by L. P. Prossen, formerly mechanical superintendent of the Yellow Taxicab Co., on taxicab specifications brought out a very interesting point in regard to the driver's position. His records showed accidents 30 per cent less with left drive cars than with right drive. There was no discussion.

Double Side Chain Final Drive

"The form of double-reduction gearing most commonly used is and has been double side chain final drive when the primary gear reduction is obtained in bevel gears driving the jackshaft, and a secondary reduction in the chains and sprockets," said H. D. Church, of the Packard truck department in his paper on "Double Side Chain Final Drive."

"This type of drive, utilizing roller chains, has been used on nearly all heavy motor trucks since the inception of the commercial vehicle business. On practically every chain-driven truck on the market today, the chains are not housed in and run exposed to dust, street dirt and water. This practice is faulty when considered solely from the standpoint of maximum chain life, but with a chain-case provision must be made for chain adjustment and for relative lateral as well as vertical movement of the sprocket centers, due to action of the rear springs. As a result many joints and bearings are necessary, which require frequent renewal and experience shows that in service the chain-case itself soon becomes more noisy than an exposed chain.

"It is extremely probable that the added cost of maintenance of the various chain-case parts, in conjunction with time losses in the garage due to the inaccessibility of contiguous parts when chain-cases are used, will more than offset in dollars and cents any increased chain mileage obtained by partial exclusion of dirt and water. The prevalence of exposed chain drives on modern trucks, and the fact that many trucks, which were originally sold equipped with chain cases, are now running with these cases either partially or entirely gone, is in itself conclusive evidence that the exposed chain design is the more satisfactory one from both the users' and the manufacturers' standpoint. The efficiency losses due to running roller chains exposed to dust and street dirt, are not at all serious.

Criticisms on Chain Drive

"The chief criticisms against chain drive have been on the grounds of excessive noise and rapid wear, but such criticisms are without reasonable foundation if the design and workmanship of the installation are proper, and if proper attention is given to the chain in service.

"Both excessive noise and wear in the chain drive may be caused by any or all of the following: (a) Too few teeth in driving sprockets. (b) Improperly cut sprockets. (c) Excessive misalignment. (d) Lack of lubrication. (e) Improper adjustment. (f) Worn-out chains and sprockets.

" A, b and c are questions of design and workmanship, and in the majority of cases where excessive noise exists in the chains on the modern truck, it is not due to anyone of these three causes. Lack of lubrication is the most wide-spread reason for noisy chains, and the fault lies primarily with the owner of the truck."

The writer has an authentic report of exposed roller chains on a 3-ton truck running 51,000 miles before replacements were necessary. This is, of course, an exceptional case, but it illustrates the possibility of chains when they are given proper care and treatment."

The paper treated almost exclusively the lead-acid type of battery, it being pointed out that this is the prevailing kind in use today. The nickel-alkiline-potash type of battery also was touched upon.

W. H. Conant's paper, on storage batteries, delt first with the cell parts which are the positive and negative plates and the sulphuric acid as the primary parts and the separators, connecting straps and containing-jars as the secondary. These six parts when assembled form a cell and any number of cells constitute a battery.

There always are an odd number of

plates per cell. One more negative is used so that the two outside plates are negative. Separators are either wood or rubber and frequently both. Connecting-straps, or bus bars, are usually of pure cast lead, milded for the particular shape desired. The former is far preferable because of the corrosive effect of battery fumes on contact surfaces, which always is to be observed to a greater or less extent even though the contacts are reasonably tight.

For different classes of service, the plates may be differently constructed. The paper treated, however, of the motor car service type only. In part it said:

"Pure sulphuric acid, which has been so manufactured and refined as to eliminate any metals or salts, is diluted to approximately one-third (by weight) of its original strength. This solution is called electrolyte and is of equal importance in the storage battery to that of the plates themselves.

"The action of these three parts—positive plates, negative plates and dilute acid—is brought about electrolytically. Starting with the cell in a discharged condition, both plates are coated with lead sulphate. When the current of electricity is passed through the cell, positive-plate sulphate is changed to peroxide of lead and negative sulphate to pure, spongy lead. This action is called charging and, when completed, removes all sulphate from the plates by the electro-chemical process of converting it into other compounds. When a battery so charged has its external circuit closed either by connecting electrical devices in the circuit or by bringing the two poles in contact, the opposite action takes place and is known as discharge. The peroxide on the positive plates and the lead on the negative plates both become coated with lead sulphate and thus the cycle is complete.

Nominal Voltage of Cell

"Every lead cell has a nominal voltage of 2.0. This is known as the open-circuit voltage. When a cell or battery is being neither charged nor being discharged—disconnected from either a source of current or a device for consuming power—it is in a state of open circuit. The voltage at such times has no practical value whatever, contrary to the fairly general impression. The actual open-circuit voltage is, however, usually higher than 2.0, depending on acid density, temperature and state of charge or discharge.

"Aside from cell or terminal voltage, there is frequent occasion to consider positive and negative voltages separately. These are observed by means of a neutral electrode, usually cadmium. A piece of this metal is dipped into the lectrolyte and a voltage reading taken to the positive and to the negative group. On discharge, positive-cadmium voltage is always higher than that of the cell. Cell voltage on discharge, then, is the difference between the two cadmium readings.

"That which determines the capacity of a storage battery, is the time during which it will maintain a useful voltage. This time, in turn, is affected by the rapidity with which the capacity is drawn upon. Finally, the low limit of useful voltage varies with the time in which the capacity is to be consumed.

Storage Battery Losses

"Losses in the storage battery are due chiefly to the differences in potential between charge and discharge voltages.

"The other loss which goes to make up the total, is that due to the longer time required for charging as compared with discharging. This loss is much smaller and, if it were the only one to contend with, would permit of interesting results. Ampere-hour efficiency varies from 87 to 93 per cent and in some cases runs as high as 95 per cent. Watt-hour efficiency, however, varies from 60 to 80 per cent and represents the real value of storage batteries."

Recent Happenings in Motor Circles

TAKES OVER LUYTIES HEADLIGHT

NEW YORK, Jan. 7—Special telegram—The Gray & Davis company, maker of an electric cranker and other electrical apparatus, has taken control of the Luyties glareless headlight, described in Motor Age a few weeks ago. This headlight has an extended and rounded milk-glass lens and besides being effective in removing glare, eliminates the use of side lights.

MEANS RECIPROCITY IN KENTUCKY

Columbus, O., Jan. 5—A decision of great importance to all car owners of Ohio was rendered recently in the Kentucky court of appeals, which upholds a state law of Kentucky, forbidding municipal authorities to license motor cars when they are provided with the proper tags of the state where they are owned. In other words, Ohio owners who desire to go into Kentucky can do so without being molested by the municipal authorities of Kentucky cities and towns. The case came up from Newport, where there was an ordinance which required a registration fee for cars used in that municipality.

RADIATOR MAKERS ENLARGING

Detroit, Mich., Jan. 6—The Long Mfg. Co., of Detroit, announces through J. L. Dryden, secretary and treasurer, an increase in the capital stock from $300,000 to $400,000. It is said that the assets of the company more than warrant the amount of the increase and that this action will permit the assuming of some very large 1914 contracts. Within the past year the company has moved in to a modern concrete factory on East Grand boulevard. At present it furnishes cooling devices to sixty-two manufacturers.

TIRE COMPANY CHANGES NAME

New York, Jan. 3—The corporate name of the Consolidated Rubber Tire Co. has been changed to the Kelly-Springfield Tire Co., and quotations of the securities on the curb hereafter will be under the latter name.

U. S. RUBBER DECLARES DIVIDENDS

New York, Jan. 3—The board of directors of the United States Rubber Co. has declared from its net profits a quarterly dividend of 2 per cent on the first preferred stock, a quarterly dividend of 1.5 per cent on the second preferred stock and a quarterly dividend of the 1.5 per cent on the common stock of the company, payable January 31.

PLUG MAKERS ORGANIZING

New York, Jan. 6—Special telegram—At the A. R. Mosler & Co. banquet plans were made for an organization in near future which is to be of a business and social nature. A committee of nine was appointed, including D. B. Mills, Rajah Co.; Albert Champion, Champion Ignition Co.; R. A. Stronnehan, Champion Spark Plug Co.; David Smith, Standard Co.; E. H. Schwab, Silvex Co.; O. Heinze, Bosch Magneto Co. It is Mosler's intention to license all manufacturers desiring to use the Canfield patent. The terms are such that this will not be prohibitive.

CALLS OHIO COMPANY BANKRUPT

Cincinnati, O., Jan. 6—Judge Hollister today handed down an opinion upon the motion for a new trial of the case of the Eiseman Magneto Co. et al. vs. the Ohio Motor Car Co., in which he adjudicates the Ohio Motor Car Co. bankrupt. At the original hearing the court held that the Ohio Motor Car Co. was solvent when alleged preferences were given.

KLAXON WINS HORN SUIT

New York, Jan. 7—Special telegram—Judge Chatfield, of the United States district court for the eastern district of New York, handed down a decision in the suit of Lovell-McConnell Mfg. Co. against the Automobile Supply Co. The suit involves patents 923,048, 923,049 and 923,132, granted May 25, 1909. The defendant is the maker of the New Tone and Motophone horns. The opinion is in favor of the Klaxon horn, made by the Lovell-McConnell company, and is a record one for length.

GERBER INVADING CANADA

Detroit, Mich., Jan. 6—Edward F. Gerber, C. H. Baldwin and C. L. Mann have incorporated the Ontario Motor Co. with a capital stock of $10,000. The company will operate in Canada and will deal in the Abbott-Detroit cars.

Car Makers Save Some Surprises for the Palace Show

New York Public Has First Chance to See New Models of Briscoe, Packard Big Six, Chalmers Little Six, Willys-Knight, Saxon, Krit and Others

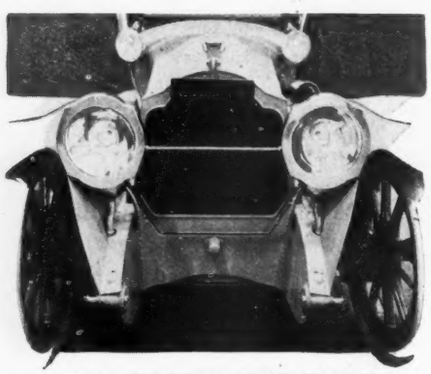
NEW YORK, Jan. 6—It has come to be a custom to expect to see several new cars or new models at the annual New York show of which the public has known little or nothing. Some of the older manufacturers take delight in reserving a new model to spring as a sensation and those that make their debut take that occasion to leap into popular notice. Motorists who are looking for sensations need not be disappointed this year, for there are several among the exhibits at the Grand Central Place.

Packard has taken occasion to give the first public airing to its latest model the 4-48. In spite of its model name, the new car is a six-cylinder creation, the "4" part of the name meaning that it is Packard's fourth 48. The rest of the model name comes from the S. A. E. rating, 48.6 horsepower. On the whole the car is the same as the recent 2-38 except for slightly larger dimensions, these taking concrete shape in the cylinder dimensions, 4½ by 5⅛ inches, and the wheelbase, 144 inches.

Details of New Packard

Like the 2-38 it has the L-head motor with cylinders cast in threes, the worm-bevel axle and the centralized control on the steeringwheel at the left. Bosch duplex ignition is used, and the motor has pressure feed to thirty-five points including the cylinder walls. Eighteen different bodies are fitted to the 4-48 chassis. Touring cars have the one-man type of top with no bows in front of the rear seat. Tires are 37 by 5 with non-skids in the rear.

The new Willys-Knight appears as a four-cylinder Knight-engined car of 4 by 5½ inches cylinder dimensions. Aside from its power producer, the car has a number of unusual features underneath—the worm-driven rear axle and the Lanchester type of cantilever spring suspension, all of which were features of its prototype of last year, the Edwards-Knight which it supersedes. It has a four-speed gearset with direct on third speed, and between the cone clutch and the gearset is a leather universal. From the worm-ended propeller shaft the drive is taken by a floating axle. Fuel is fed to the Stromberg carbureter by pressure. The other equipment includes a Simms magneto, U. S. L. lighting and cranking system, 36 by 4½ inch tires on wire wheels, an extra wheel being supplied. Left drive and center control with ball-type lever is stock, as are a one-man type of top and a one-piece windshield, the feature of which is that there is no molding at the top, the rounded edge of the glass forming the upper edge. The speedometer is driven off the universal. The wheelbase is 120 inches and two bodies are offered, a two-passenger roadster and a five-passenger touring, at $2,750.

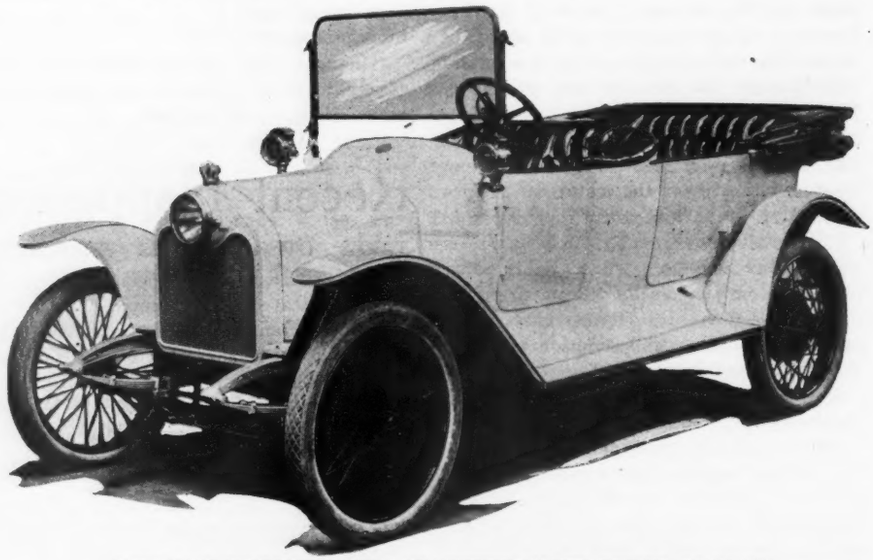


MUD APRON ON THE NEW PACKARD

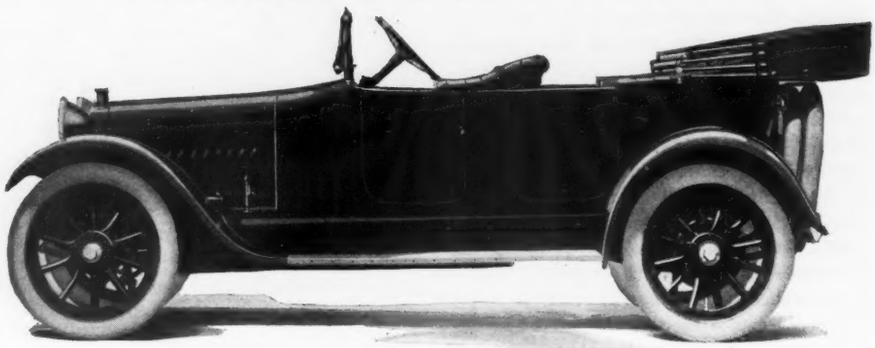
Running Boards Are Clean

Body lines are smooth and runningboards are clean, the tool boxes being carried under them. Very neat ventilators are provided in the dash. A little thing which shows thoughtfulness on the part of the designer is a foot rest in front of the accelerator pedal so placed that it is in the middle of the sole and acts as a fulcrum for the toe of the person who is driving.

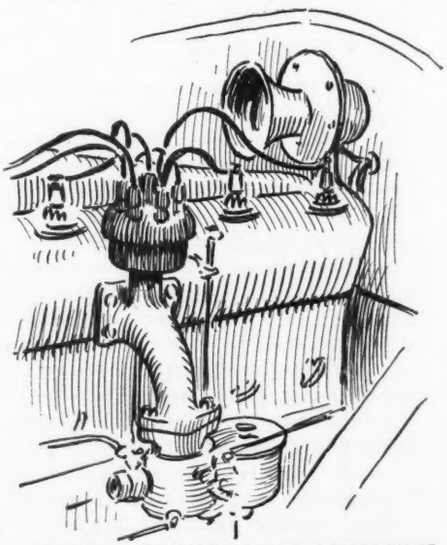
Pathfinder's latest model, called the Daniel Boone, is a light six with a Pathfinder-Continental motor of 3¾ by 5¼



BENJAMIN BRISCOE'S NEW CAR, WHICH MAKES DEBUT AT SHOW



THE CHALMERS SURPRISE, A NEW LIGHT SIX



MOUNTING OF HORN ON THE NEW CHALMERS LIGHT SIX

cylinder dimensions. Its chief departure from former products of this factory is in the rear suspension which is of the cantilever type which is particularly substantial. A very easy-riding car has been obtained with this design, a ride on one of the experiment models at the Hoosier factory over some very bad roads showing unexpected freedom from bumps.

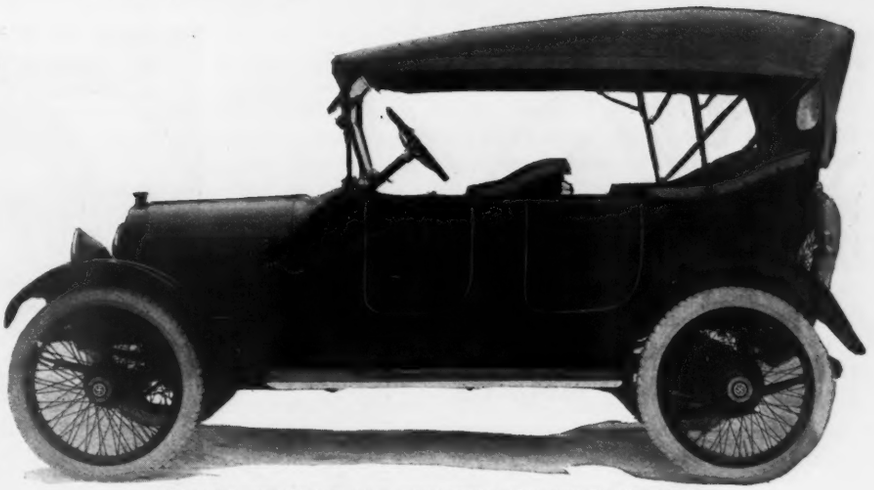
Another of the features of the new model is the box type of middle cross member of the frame in which the brake shafts are carried with grease cups projecting through for lubrication. The special Pathfinder yoke and torsion tube assembly carries the drive to the floating axle. A four-speed gearset is used with direct on third. Wheels are 34 by 4½ inches. This like the other six has a pointed radiator. It sells at $2,275 as a touring car for seven and at $2,222 as a five or two.

Chalmers unveils its new light six as a five-passenger tourist selling at $1,800. It is called the six-48 and bears the model number of 26 being a smaller brother of the older model 24. The reason for its appearance was to produce a car to meet the demand for sixes of low initial cost and maximum economy.

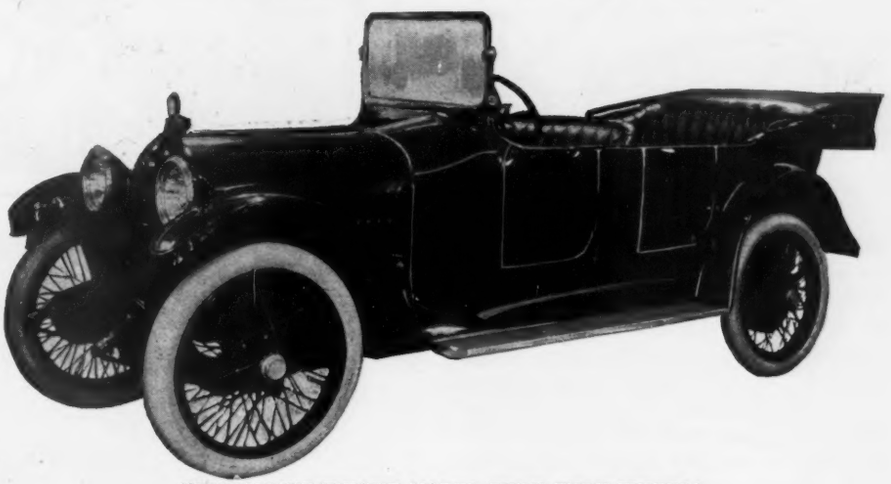
Cylinders Cast in Block

The motor has T-head cylinders cast in block of 3½ inches bore and 5½ inches stroke. It is stated that extensive dynamometer tests show 54 horsepower in continuous running, the unusual power probably being due among other things to the extra large valves made possible by the T-head construction. The gas is triple-heated on its way to the cylinder by hot air, hot-water jackets about the carbureter and by the water jacketed intake manifold. Valves are tungsten steel, motor lubricated by combination force feed and splash. Water circulation is an improved thermal system, a departure from previous Chalmers practice in which a pump has figured.

Motor equipment includes a Rayfield carbureter and the Chalmers-Entz lighting and starting system, the feature of which is the fact that the starter always is connected with the motor and keeps the latter running under all circumstances, except when shut off at the will of the driver. It is said to be impossible for the motor to stop even should the gas be shut off accidentally and the starter helps the engine pick up after changing gears. This makes the motor unstallable, according to Chalmers' engineers. Another feature of the motor equipment is the ignition system, no magneto being used, an Atwater Kent distributer mounted on the intake pipe handling the battery current for sparking.



SPECIAL TOURING CAR FEATURED BY KRIT FOR 1914



NEW MOLINE-KNIGHT MODEL WITH WIRE WHEELS

Clutch of Disk Type

The clutch is a disk type with cork inserts similar to that of the model 24. The gearset gives three speeds and is operated by a central lever, the gear being interlocking at all speeds. The axle is the floating type, rear springs are three-fourths elliptic underslung. The wheelbase is 126 inches and tires are 34 by 4 inches. Steering is on the left and there is a primer on the dash to the manifold for starting as well as a dash carbureter adjustment.

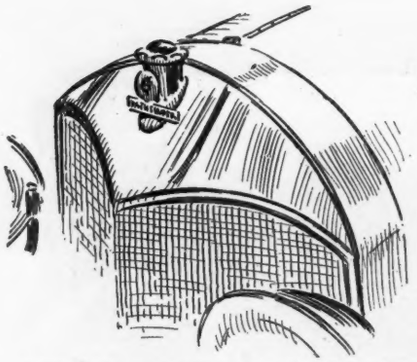
As to bodies, the car has a long sloping cowl in which the fuel tank is carried, tapered bonnet and bell-backed tonneau. The tank portion of the honeycomb radiator is rounded as are the fenders. Running boards of course are free from encumbrances. In addition to the touring car there is a convertible coupe-roadster called a couplet.

Built to Save Fuel

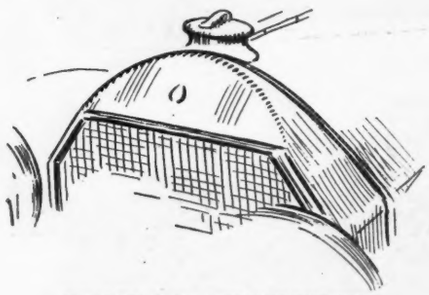
The car really is light for a six, the weight given by the factory being 68 pounds per horsepower. This makes for economy and repeated tests by the Chalmers engineering department has shown 20 miles per gallon of gasoline—made by an experienced driver after the car was well warmed up.

American eyes have their first opportunity to view Benjamin Briscoe's new car at the Palace. This is now being manufactured in Europe and deliveries from the American factory are promised in April. There are two cars in the line, a light five-passenger model at $900, complete with electric cranking and lighting, which is in

SAXON ROADSTER, DEBUTANTE AT THE NEW YORK SHOW



V-SHAPED RADIATOR ON PATHFINDER



RADIATOR ON WILLYS-KNIGHT

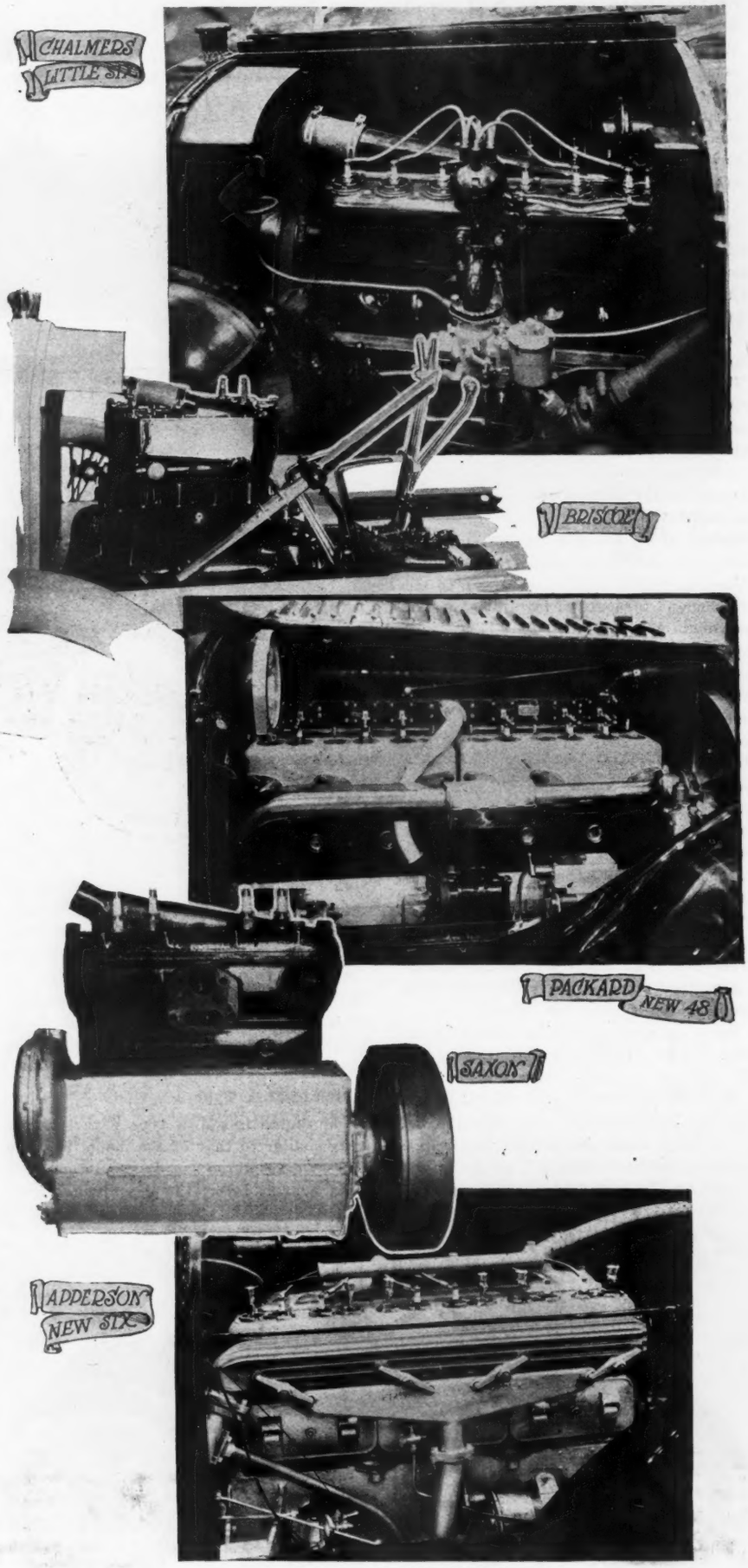
no sense a cyclecar, and a four-cylinder cyclecar which has not appeared as yet on this side of the water.

While the prevailing idea in the design of the big car is American, inspiration has been taken from the European school and European experts have had a hand in the design. The new Briscoe has a unit power plant, three-point suspended, the four-cylinder block motor having cylinders of the L type 3⅛ by 5⅛ inches. Cylinders and crankchamber form a single casting, the bottom part being a pressed steel oil pan screwed into position. This implies a two-bearing crankshaft, whose diameter is 1⅞ inches. The carbureter is a European model and the magneto is Briscoe construction. The cooling is thermo-syphon with a propeller-type fan.

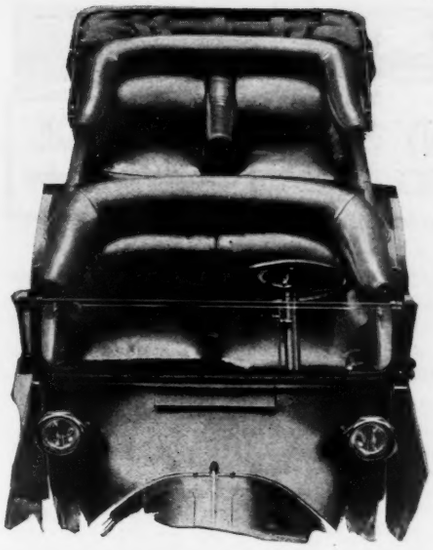
Details of Briscoe Car

The flywheel contains the leather-faced cone clutch and a very compact three-speed gearbox is carried by crankcase arms. Control is center and steering is optional, the steering wheel location being susceptible of easy change if desired. One side of the gearbox is detachable so that a lighting and starting generator may be driven from the gearset. Final drive is by propellor shaft to the floating axle. Springing is by long semi-elliptic springs front and rear. The wheelbase is 105 inches, tires are 30 by 3½ inches and the tread is standard. The chassis weighs 980 pounds and the complete car weighs 1,700.

European style is followed closely in the body. There is not a break in the smooth lines from the radiator to the back of the tonneau. The tank is placed under the scuttle dash and the single headlight is incorporated in the center of the upper portion of the radiator. The latter is made



MOTORS ON FIVE OF THE LATEST ADDITIONS TO THE MOTOR CAR FIELD



UPHOLSTERY ON LOCOMOBILE

of aluminum. Electric lights are fed from a storage battery in the stock model which lists at $750, and includes horn, battery, demountable rims and tools. When fitted with lighting generator and electric cranker, top and windshield, the price is $900. Wire wheels are stock squipment.

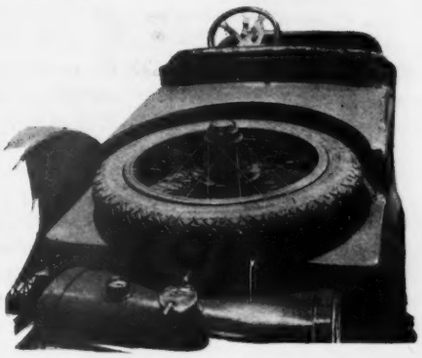
Ward Electrics on Display

The maker of new Ward electric passenger cars, first announced at the time of the electric show at New York last fall, has several models of passenger vehicles on display. The details of these cars have been given in other issues.

The Carnation, one of the products of the American Voiturette Co., Detroit, whose other product is the big Keeton, up to this time generally has been considered more of a cyclecar than a large one. However, now that the public has an opportunity to look it over it hardly seems that the Carnation can be relegated to the cyclecar class. About the only features that are cyclecarish are the low price, $495, $510 and $520 for the side, byside two-seater, the tandem two-seater and the four-passenger touring, respectively, and the low weight which is well under 1,000 pounds, aside from the fact that the tread is less than standard, 48 inches.

Features of the Carnation

It has a four-cylinder block-head motor of quite respectable dimensions, the cylinders being 3⅝ bore and 3¾ stroke. It has magneto ignition with fixed spark. Mayer carbureter, thermo-syphon cooling, adjustable belt-driven fan and pointed radiator comprise the motor features. A disk clutch and three-speed gearset with propeller shaft through a torque tube to the semi-floating axle constitutes the transmission system. Left drive and center control



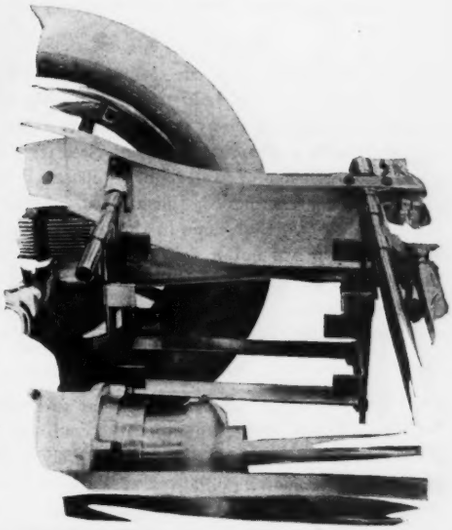
TIRE CARRIER ON PREMIER RUNABOUT

are provided. Wire wheels are stock, the wheelbase is 104 inches and the tires 30 by three.

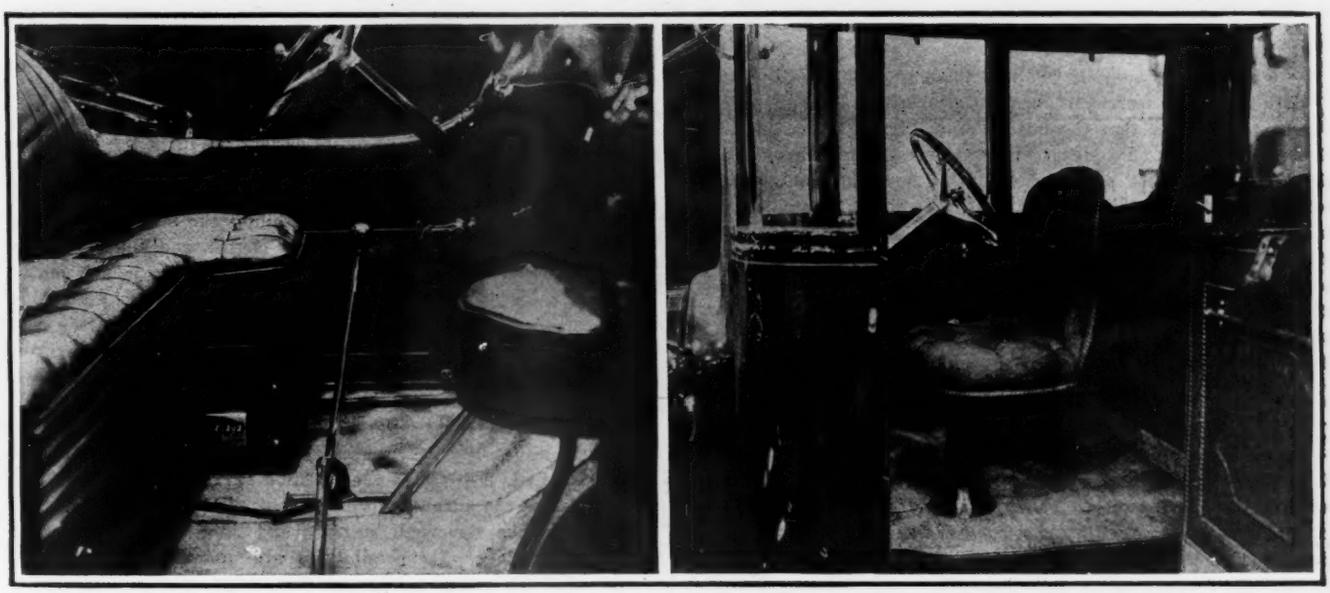
The little Saxon at $395 also makes its bow at the Palace. It appears only as a roadster. It has a four-cylinder block motor of 2⅝ inches bore and 4 inches stroke. The motor is exceptionally businesslike and cleancut in appearance, and is of Continental manufacture, though of Saxon design. The four cylinders and the crank case and exhaust and intake manifolds are made in one casting. A removable water-jacketed head fits over the cylinder block. Vacuum splash is relied upon for lubrication. The carbureter is a Mayer and the ignition is by the Atwater kent system with dry cells. A dry-plate clutch of five disks transmits power to the rear end, where the three-speed gearset is mounted on the semi-floating axle. Control is center and drive left. Wire wheels are fitted with 28 by 3-inch tires.

Krit Features Touring Car

The new Krit special touring car is the Krit 1914 features with the streamline, leather lined body, cork-linoleum, nickel-bound running boards, rounded radiator and other points of construction. In addition to this equipment, the Krit special touring car is fitted with five demountable wire wheels, Goldie patent one-man top and seat covers with patent leather arm rests. This new model sells for $100 more than the standard touring car, $1050, and $1150 with electric starter.



BATTERY CARRIER ON THE LOCOMOBILE



INTERIOR VIEW OF THE FRANKLIN

DRIVER'S SEAT IN NEW OVERLAND COUPE

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The New York Show

THE present Grand Central Palace exhibition must be considered the best accessory exhibit in connection with any of the recent motor shows, this notwithstanding the fact that few of the tire makers are present and the manufacturers of different types of bearings also are absent. The grouping of accessory makers on two of the floors is much preferable to arranging them in button-row fashion along the edges of narrow galleries. The management also must be congratulated in running the elevators to the top floor without stop, thus making certain that the crowds get to the top or fourth floor and then walk down past the accessories and all of the cars. In view of this the four-floor scheme is fairer to all than the ampitheather design possible in Madison Square Garden or the Coliseum. The accessory makers will profit more from this show than from previous ones.

WHETHER or not car companies are making an error in neglecting to include stripped chassis as a part of their exhibits is a question many are trying to solve and on the face of it there seems a general sentiment that it is a mistake not to include the polished or well-painted chassis. Some of the biggest merchandising companies, those whose output is over the 10,000 mark, in fact, all that come in this class, have the stripped chassis, whereas there are not a few other concerns with not one-quarter the output and with cars selling at the same figure, not using the stripped chassis. The stripped chassis still has much magnetism and the moving chassis has a great deal more.

OPENING night demonstrated that the crowds are still around the chassis and although you could not get near them it never was difficult to walk up to the finely finished limousines and get all the scrutinizing glances at them you desired. Our makers should remember that motor and chassis mechanisms still have great attractions, more perhaps than finely finished interiors. In the Palace three or four of the most progressive car-building and merchandising companies not only have stripped chassis but have cutaway ones with many of the parts running.

THE successful merchant always endeavors to have the goods on the counter that the buyers want. So it should be with the car exhibitor. People come to shows. Why? Surely not simply to take a look at the outside of a body, although it cannot be denied that this is a part of the mission. But look at an exhibit and watch the visitors. A few glances at the body suffice, but, when the introduction to the chassis is made, the visit is prolonged materially, many questions are asked. The chassis still has its magnetism, which is as strong as it was 5 years ago, and which will continue, because if shows are only for body styles, then a day or so will suffice instead of a week.

THE thirst for information is one of the best indications of a good live motor car exhibition. Stray through the accessory departments and note the intelligent owners who visit the carbureter exhibits and want to know how their particular model of carbureter should be adjusted. Thousands of these accessory visitors drive their own cars and they seek genuine information, not the glib-tongued hollow talk that is met with at many stands. These owners want facts, not fancies. The carbureter maker who does not put one or two of his most practical men in charge of his exhibit is not going to cash in as strongly at the closing night as that maker who has manned his exhibit with practical carbureter men, who have answered honestly the questions that have been asked. Satisfied customers are the best asset of any growing organization and the shows offer unlimited opportunity to do much of this satisfying work. What is true of carbureters, is true of a dozen other accessories.

PERHAPS no other part of the car is closer to the owner and driver than the carbureter. It is the one part that every driver thinks he can improve upon if occasions demand. With the magneto he can clean a part or replace another, but can do little if any adjusting. With the carbureter it is different. Many of them have springs that can be increased in tension or diminished, and they have nozzles that can be changed for larger or smallers ones and have floats that can be raised or lowered. All of these possible adjustments make the driver hungry at times, to satiate his thirst for meddling with something. Carbureter makers are taking recognition of this and are doing much to eliminate the necessity of adjustment. One maker has had his carbureter tested at sea-level on the Pacific coast, in mountain altitudes in Colorado, on the plains of the Mississippi, in the Alleghanies and at sea-level on the Atlantic and has found that it is not necessary to make a single adjustment under all of these varying conditions. How disappointing this must be to some of those meddlesome-inclined individuals, who have to work out their restlessness on some car parts.

The Electric Transmission

TRULY these are days of transition, days when you must ask each morning what has transpired since sunset, what new victories have been won, what new campaigns organized. The present show has brought forth the electric transmission, a unit which in addition to taking the place of the flywheel clutch and the gearbox for changing speeds, also does away with the electric starter and the generator for electric lights. The electric transmission in its present form is revolutionary, partly because of the part it plays in the chassis and further in that it has been tested out over tens of thousands of miles and has measured up to the fondest anticipations of its owners. With it the driver has a noiseless drive on all intermediate speeds as well as on high and has his control centered in a small lever on the steering wheel, a lever little larger than that controlling the spark or throttle. With this small lever you crank your engine, and get all of your forward speed changes. The electric transmission is not new, it is much older than the six-cylinder motor and older than the four-cylinder one. In principle it is practically the same as the electric dynamometer which is used in our best laboratories. From a weight point of view it is on a par with present constructions which include clutch, gearbox, starter and electric generator; and viewed from the great determining point of price, even today in its early stages, it is but very little more costly. Its possibilities are unlimited, it gives to the gasoline car all the merits of the electric, with the advantage that the battery has not to be carried, any more than the small starting and lighting battery on any gasoline machine. Its possibilities are unlimited and it would seem that the entering edge of the wedge of a revolutionizing force in motor car construction has been entered

Motoria Has the Right-of-Way in New York This Week

Late Body Styles as Seen at the Two New York Shows

Comparison of Coach Work at the Palace and Importers' Salon Redounds to Credit of Americans—Clean Running Boards and Inside Control Are Features Usually Not Found in European Carrosserie

By L. V. Spencer

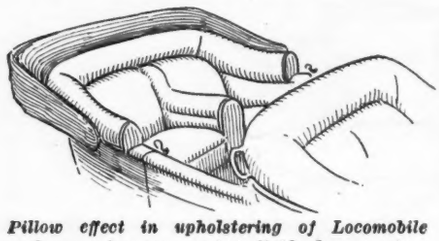
NEW YORK, Jan. 5—The New York motor car exhibitions this year are body shows more than ever before. At the Palace there are fewer chassis on view than last year and more play upon elaborate examples of coach work and refinement of details for the comfort and convenience of those who ride in the cars. At the importers' salon it always is true that more stress is placed upon the body side of the show than upon the chassis, and this year only half of the foreigners are submitting chassis for inspection.

Some of our own old established makers are beginning to take the attitude that the public has confidence in the makers' ability to furnish the best possible mechanical constructions and needs only to submit the bodies for this public's approval. In most instances where chassis without bodies are shown at the Palace there is some new constructional feature which is a big departure from the conventional and which the maker believes should be shown the public. Then, of course, many of the newer makers and those who are equipping with novel types of motors feel that they should exhibit these constructions. The public is not familiar enough with electric gearshifts, two-speed axles, non-poppet motors and so on not to want to be shown why and how these work and why the designers who have incorporated them in their chassis have deemed it wise to do so.

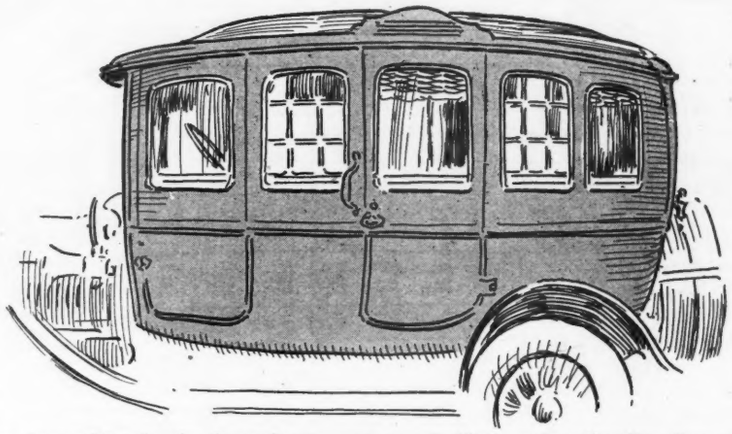
Inclosed Cars Are Many

But in general where there is nothing radically new in the chassis design, only advanced and novel body types appear besides the stock models. There are many inclosed cars of one form or another submitted to the critical public, nearly every maker in the Palace who produces any kind of closed vehicle whatever having an example of it on hand.

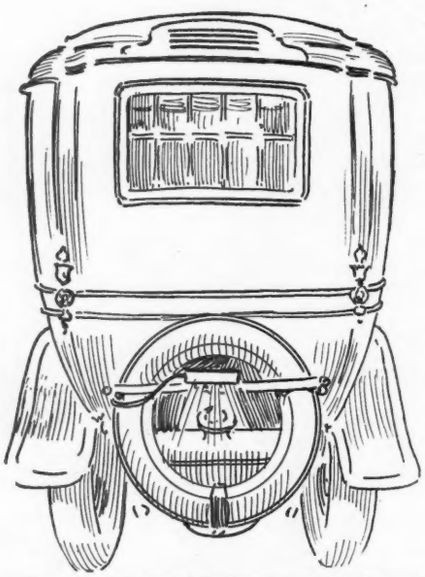
There are the usual types of closed vehicles, such as berline limousines, standard limousines with open front compartments, coupes, landaulets and sedans. Besides these there is another type of car which is very numerous at this show. It is the cabriolet, and the Detroit makers in particular seem to have taken very kindly to it, many of them exhibiting such a car.



Pillow effect in upholstering of Locomobile show car in green—note individual rear seats



Side view Locomobile showing limousine in mauve and black—note attractive lines—interior upholstered in silk tapestry



Rear view Locomobile limousine showing red signal lamps at either corner besides license light—notice multi-pane rear window and design of body above it—also lines of body

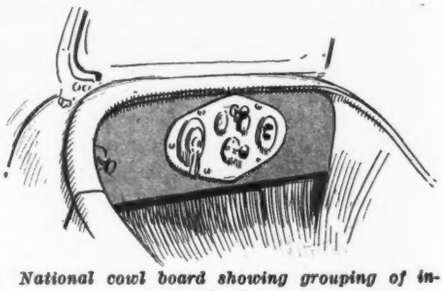
Cabriolet Bodies Shown

The construction is not exactly new, but its perfected form is very desirable for all year around use. It is really a roadster which when the top is up completely incloses the interior against the outside elements. And when the top is down, you have as open a roadster as could be desired. Premier had a model of this type last year at Madison Square Garden, and called it a touring roadster. But "cabriolet" seems to be the accepted name. Such a car should prove very popular among the business men who have a lot of running around to do in all sorts of weather. Among those showing such a type are Hudson, Oakland, Studebaker, Cadillac and Keeton.

Coachwork Better Than Ever

The finish and coach work this year seems even finer than heretofore. It is hard to see how such beautiful lustre can be imparted to a body as is now evident in nearly all cases. Of course, the more expensive cars are brought to a mirror-like gloss, but even on the low priced models, the painting leaves nothing to be desired. And this is not only true of the sombre blacks and subdued reds, but appears in the finishes of green, purple, white, yellow and other colors which are not generally supposed to admit of such high polish.

In standard form the average car exhibited is a very sombre affair indeed. That is blacks, dark blues and dark maroons predominate and were it not for the bright hues of some of the pea green, canary yellow, grey white, mauve and light brown show cars, the Palace would look like a funeral. Striping even has been abandoned on some of the leading makes. Though plain unassuming colors are the mark of distinction and refinement, the makers should not go to too great extremes of plainness. It can get so far as to detract.



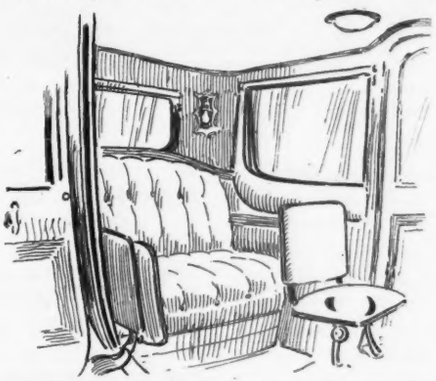
National cowl board showing grouping of instruments in center

The American makers as a whole have well accomplished what they set out to do in eliminating all obstructions from the running boards. In this they are ahead of their foreign contemporaries, if the exhibits at the salon are a fair example. There can be no doubt that, in this day of smooth sides and unbroken lines, the littering up of running boards with boxes and cases is a disturbing factor. It detracts from the very effect which the designer contrives to create when he substitutes curves for sharp edges.

All Levers Are Inside

There are also no examples at the Palace of placing control levers outside of the body. The designers have realized that it is unnecessary to mar the clean outward appearance with these. It is just as easy to design a chassis with them either in the center or within the confines of the body as it is to bracket them outside of the frame rail, as is done with some of the very best examples of foreign construction. Besides having to reach over the side of the body to get at these levers is not very convenient either.

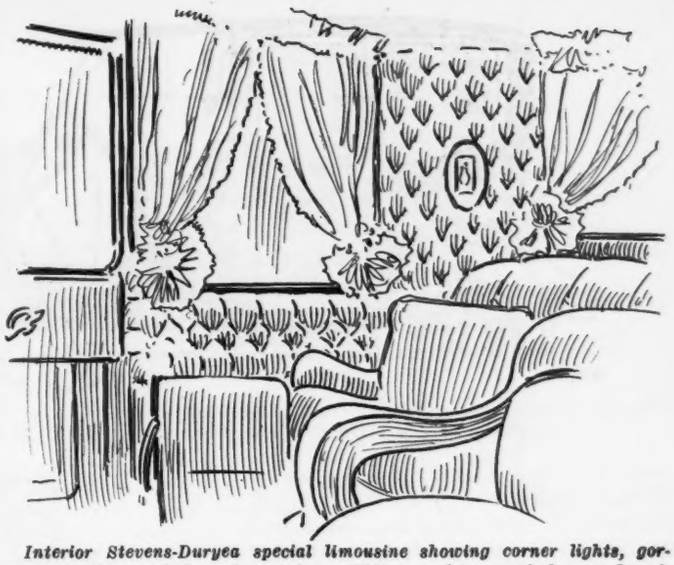
Show cars are more numerous this year at the Palace than ever before, and lend new interest. Most of these show cars—and by that is meant special body designs which are more elaborate than would ordinarily be fitted to the chassis—have unusual color combinations and fixtures. They are designed essentially to attract attention, and they accomplish their purpose.



Interior Pierce Arrow town car showing elaborate corner lights of Pullman type, upholstery in brown and fittings gold

Each one of these special jobs will find a buyer, and for the man who has a long pocket book and seeks originality they are the thing. Most attention has been paid to getting up elaborate interiors for closed cars. Locomobile comes first this year with most thrills, having three cars which are very striking in color as well as construction. There are two closed types and an open car in the Locomobile display which cannot help but attract attention.

The most elaborate of these Locomobiles is a limousine which is mauve and black outside, while the interior of the rear compartment is upholstered in gorgeous silk tapestry. The usual construction with a rear seat and two auxiliary seats is followed, but the ceiling and sides above the seat are finished in dark paneled wood which matches the dark tapestry. Multipane windows are fitted in the sides and the rear, while the metal parts within are in gold. In each rear corner there is a recess in which is set a tiny chandelier carrying an octagon electric lamp which is shaded with the same material as the curtains—dark mauve silk. The lower part of each chandelier carries a cameo. The curtains on the windows draw to the top on wires, so that when up they give the effect of a tiny drawing room when seen along with the chandeliers and draperies. The effect with the tapestry upholstery shows the possibilities of the art. Besides the usual fixtures, there is a cane rack, toilet set, telephone to the chauffeur and detached cushions or pillows of the same material as the upholstery. Outside at the rear is another novelty in the fitting of fancy red lamps at either corner in addition to the license light. To carry out the effect even the extra tire covers are made in a color cloth to match the body. The car is to sell for $7,000.



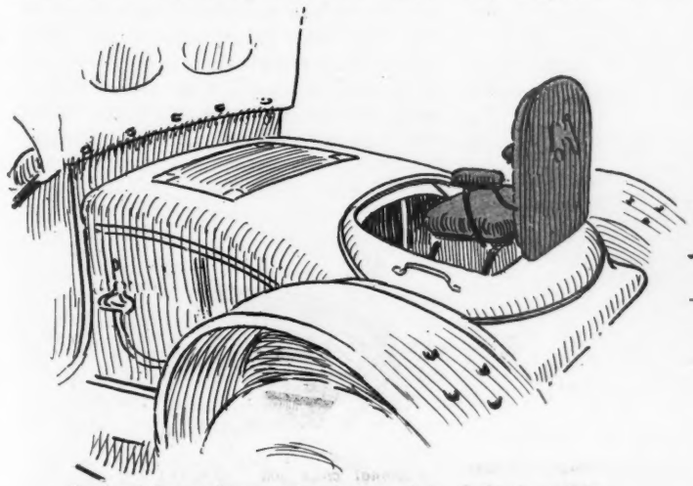
Interior Stevens-Duryea special limousine showing corner lights, gorgeous tufting and draped curtains. This car has regal brown broadcloth for the seats and silk brocade upper part

Locomobile Shows Black Limousine

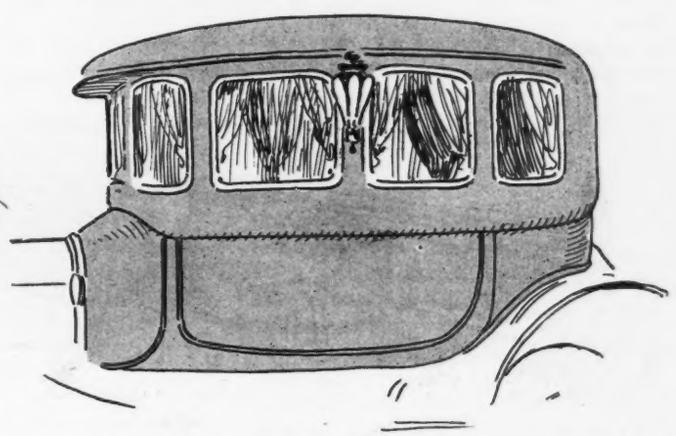
Locomobile also has a beautiful limousine in black, and a surprisingly genteel effect is obtained within by the use of blue plush upholstery. This is not tufted, but put on smoothly. This color together with the lamps and other fixtures to match makes a plain but elegant whole.

The loudest of the three Locomobiles is a pea green touring car which has unusual morocco leather upholstering of the same color. The rear seat is divided by an arm, while instead of tufting, the leather is laid on smoothly and padded rolls of large size line the seats and arm rests. There is no division in the front seat. It is hard to imagine anything more comfortable than such a padded seat.

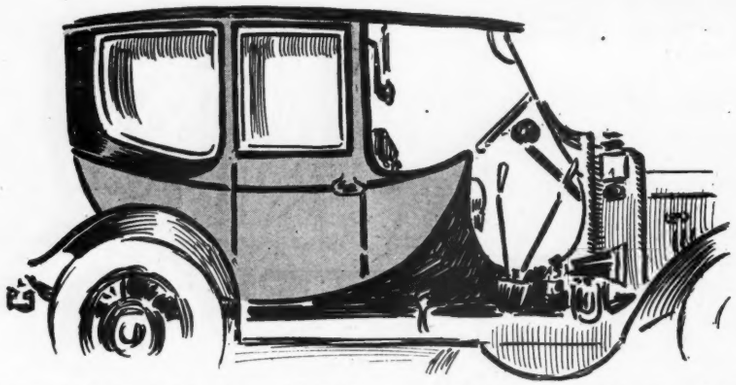
Peerless also has several striking show cars, chief of which is a green closed car which is on the order of a sedan. In-



Packard has a disappearing rear seat in deck of roadster



Peerless sedan in green finish—only one door on right side. Chairs within are weighted to prevent hopping around

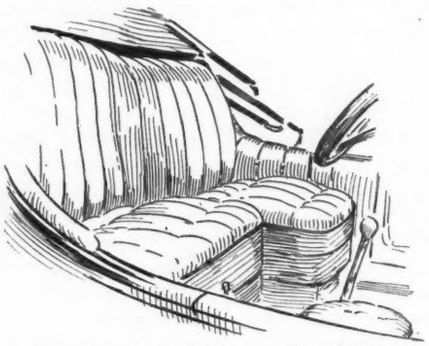


Reverting to old types—A Brewster coach which goes back to the days before the colonial; also note windshield sloping to rear to bring glass closer to driver's eyes

stead of seats, this beautiful car has individual colonial arm chairs within, which are movable. These are richly upholstered in tapestry to match the green draped curtains at the windows, and there is room for two of them at the rear, while forward and next to the driver's seat there is more of a straight backed chair of the same type. The driver's chair is fixed in position for obvious reasons. To get rid of any tendency to jump around due to jarring, the three movable chairs are heavily weighted in the seats. The construction is said to be entirely practical and at the same time, it gives a greater possibility of sociability. There is only one door to the car and that is on the right side in the center. The price of $7,500 is to be expected.

Stevens-Duryea Has Pullman Lights

Stevens-Duryea is also a contender for show car honors with a very sumptuously furnished limousine which is painted in dark brown for the main part and has black trimmings. The interior is in regal brown broadcloth for seats and silk brocade for the upper part. The tufting of this brocade is continuous from sides to roof with no corners. In each rear corner is a Pullman type of lamp. The cover of this lamp is a small mirror and when a button is pressed, the cover springs back out of the way, exposing the tiny bulb and lighting it at the same time. One of the extra seats is a full arm chair type while the other is folding. The windows are sashless and small handwheels may be turned to raise and lower them. There is a full toilet set containing everything from smelling salts to manicure articles. There is a cigar tray, a chauffeur telephone, and a cigar lighter.



Franklin open roadster seating drive seat forward and an extra seat in front of main passenger seat

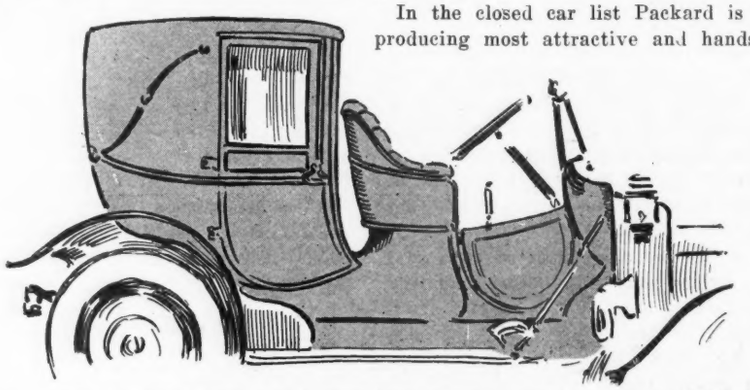
Stevens also has a handsome sedan on display which is brown and black outside and finished in buff broadcloth within.

Other beautiful cars with special colors and interiors are shown by many of the leaders. National has a light grey coupe on its six cylinder chassis which is made specially distinctive by the use of a wide black panel on the doors. It is luxuriously upholstered in grey. Keeton has some very beautiful bodies in usual colors.

Snow White Velie

Lozier too is in line with two open cars in canary yellow. Havers has some unusual greens, purples and browns. Abbott has a very pretty car in dark blue with blue cloth upholstery to match; Cole has some beauties with greys and white predominating; Velie is showing a snow-white car. Chalmers is showing a car in dark green.

In the closed car list Packard is still producing most attractive and handsome designs and colorings. A limousine in dark blue and black upholstered with corduroy is of note.



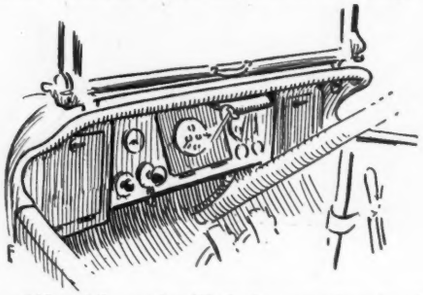
There is a tendency in smart town cars to completely separate driver's seat from closed portion as shown on the Delaunay-Belleville

Pierce has a mauve colored limousine with gold trimmings. Winton, Cadillac Oakland, and Abbot also have closed vehicles on display which are in unusual colorings inside and out.

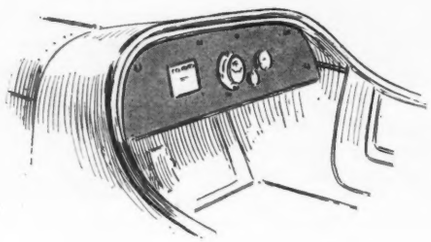
New Roadster Construction

These show cars give the prospective buyer an opportunity to see just what these body builders can do if they have plenty of lee way so far as cost is concerned.

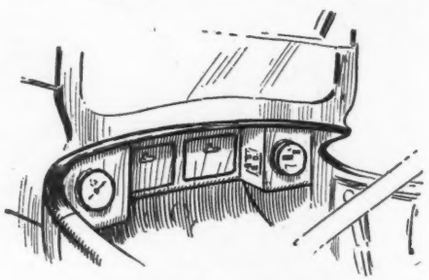
A construction for roadsters which is new to this country was seen in a number of types at the salon. We refer to the concealed rear seat type whereby the seat may be folded down into the rear deck. The seat back, forms part of the top of the deck and when in closed position is flush with it like a trap door. This is made for either two people or one. Packard is showing a roadster with this disap-



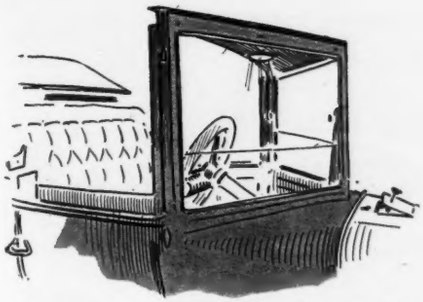
Oldsmobile cowl with lock compartments at either side and instruments arranged in the center



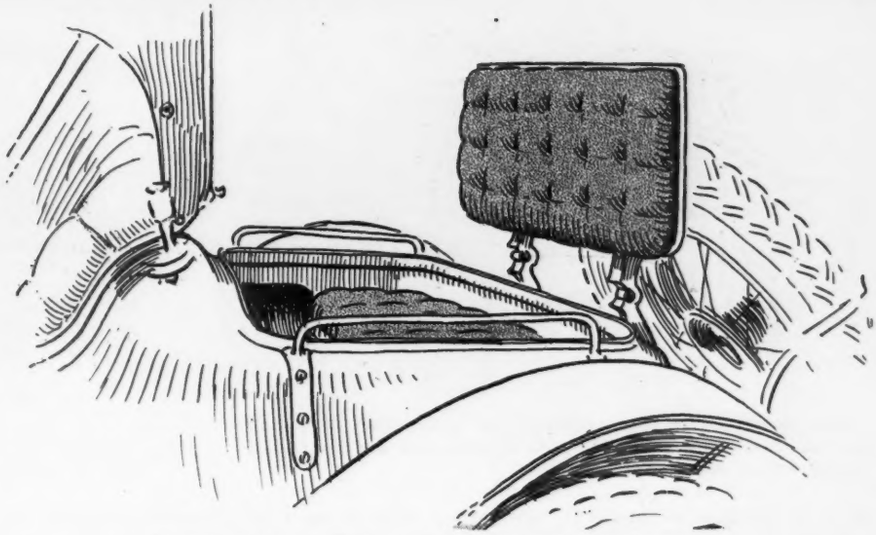
Premier dash of exceeding simplicity—highly finished wood. This is characteristic of the speedster model



Fiat dash with lock compartments in center and symmetrical arrangement of clock and speedometer



S. G. V. has a convertible roadster with a V-glass front

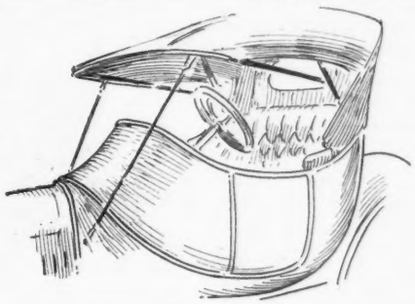


Disappearing rear seat on Isotta. A coming design for roadsters

pearing rear seat at the Palace, while Marmon also has a body design which converts the rear deck into seating for emergencies.

More attention is being paid to the lighting of cars than heretofore. The lamps themselves are more numerous, and whereas many limousines used to be provided with a single dome light, the new ones have corner lights as well. This lighting has become almost universal in limousines especially, nearly every one seen at the Palace being so equipped. These lights add an attractive touch whether they are actually needed or not. On the new Winton sedan, a light is concealed under the body so as to shine on the running board below the door. When the latter is opened, this light is automatically switched on. This same car has three lights ranged along the top edge on each side within.

Open cars also are in several cases being fitted with tiny lights on the back of the front seats to shine on the tonneau. Abbott and Stearns have these. Side lights are also disappearing, many of the new cars appearing with clean sides, the headlights taking care of this. Either dimmers are fitted or there are two separate bulbs for city and country driving.



Unique lines of Jeffery roadster

Cowl Instrument Boards Lead

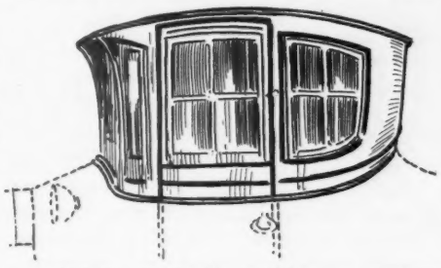
Dashes for open cars have come in for great attention within the last year. Almost without exception, the cars at the Palace are fitted with a cowl board on which the instruments are symmetrically arranged. Finely finished wood is prevalent among the higher priced cars, although leather lined cowl boards are equally as prominent. Many cases are found where small compartments are a part of the cowl board, these being provided with locks. The Oldsmobile dash is a good illustration of this, as is also the Fiat. Special grouping of the instruments is also favored. In many instances these are specially set in metal panels which carry all necessary instruments, such as gauges, speedometer, pressure pump, switches and the like. National, Oakland, Peerless, Locomobile, Stearns, Haynes, and many others have made special groupings of note.

Sashless Window Universal

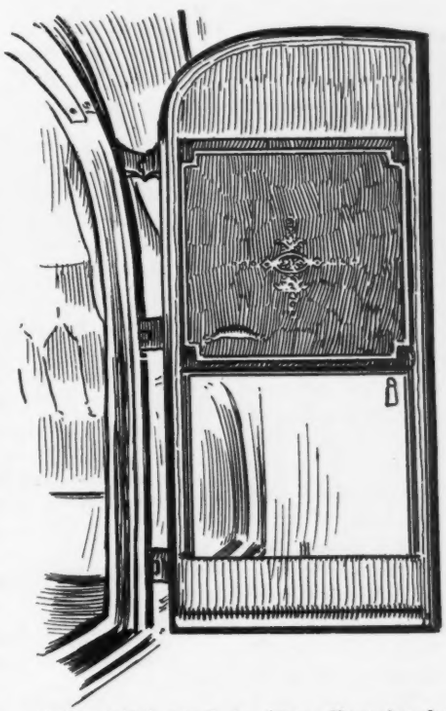
In closed cars, the sashless window is now nearly universal as is also the hand wheel method of raising and lowering. These sashless panes of glass play in felt lined grooves and are fitted with anti-rattler mechanisms, which preclude any possibility of rattle.

This year there also seems to be a much greater tendency toward special materials for upholstery. The conventional whipcords for closed cars and buffed leather for the open models is being crowded by such new materials as corduroys, plushes, morocco leather, special broadcloths and others which have shown that their wear resisting qualities are equally as good as are those of the whipcords and at the same time they admit of more luxurious treatment. There was a surprising number of open cars with some color or other of cloth covering.

There is also a tendency towards increasing the amount of glass space in the closed cars. Windows are given full sweep of the sides, and panels are only wide enough to give support and hold the windows. Many attractive designs of these windows are in evidence, the rear side windows which are rounded being very popular. It also would seem that a much larger pane in the rear is being used so that the car's occupants can be afforded an unhampered view in all directions.



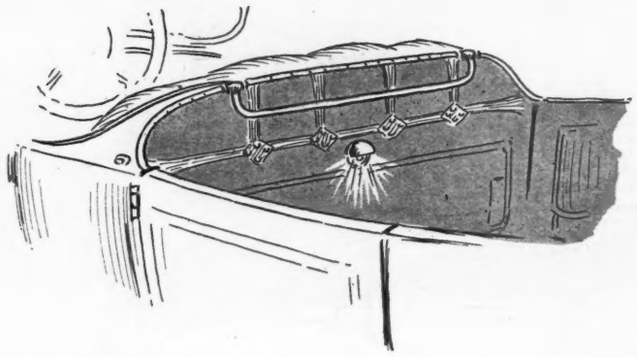
Klinekar convertible roadster or coupe—a few bolts hold top in place. For summer this top may be removed and a folding top substituted



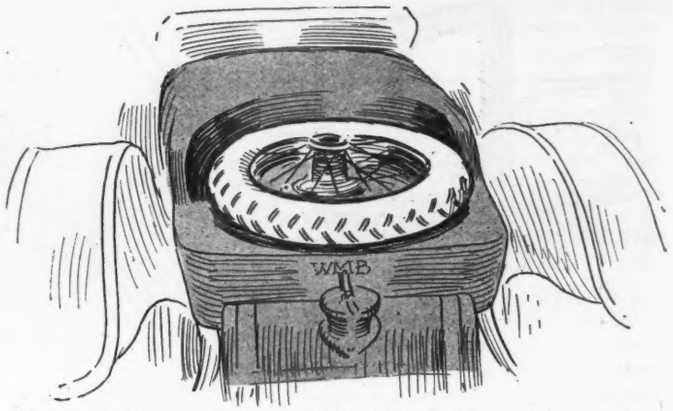
Wide inlaid panel in doors, limousine by Moore & Munger on deDion chassis. This has not been taken up much by American makers

Windshields Have Been Improved

Windshields also are improved and much of the strengthening which they have obtained is due to the fact that tops are being fastened to them. They have been constructed along ventilating and rain vision lines and very often when side lights are fitted they are placed in brackets integral with the sides of the windshields. There are even cases where no top panel is used with the windshield glass. This



Back of front seat new Stearns-Knight upholstered in unusual style in black morocco leather. Note tonneau light and flap for concealing folding seats when not in use



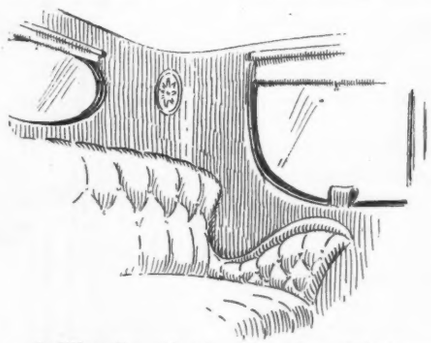
Premier hollows out the rear of the deck of this roadster to give room for extra wire wheel which is carried on a dummy hub

gives a distinctive touch to the car's appearance.

Special attention seems also to have been given to the carrying of spare tires, which are in the majority of cases placed at the rear. Where wire wheels are used, dummy hubs are fitted on which the spare wheel is fastened. The Henderson is a good example of this as is also the special Premier roadster. The rear of the deck of this car has been sunken to take the wheel and a dummy hub fitted. But with regular demountable rim construction on wood wheels, the development of the carriers is equally as advanced. Many cases are found of the fitting of dummy rims at the rear to which the spare rim is fastened just as it would be fitted to the wheel. This done away with straps and makes a very rigid mounting.

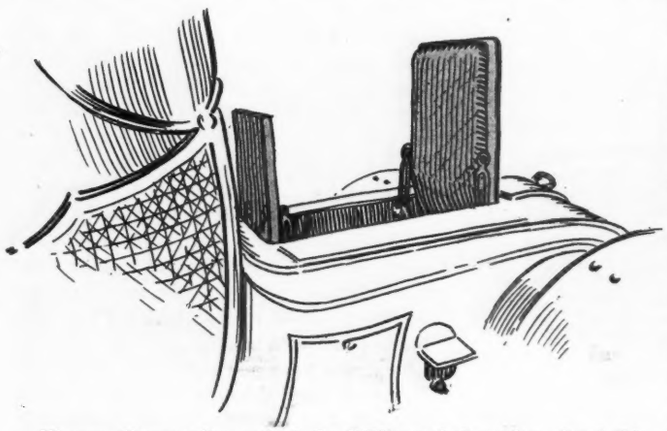
Auxiliary Seats Disappear

There has also been much improvement in the fitting of the auxiliary tonneau seats and the means for disposing of them when not in use. Many makers have adopted the folding type which goes into an aperture in the back of the front seat. Stearns has adopted this, Studebaker does it and many others. The special Holbrook bodies on the DeDion and Mercedes chassis at the Salon give a good hint as to the best way of completely closing up these apertures after the seat has been folded down. The Mercedes type of body has doors which close on them while in the DeDion roller wood covers which go into the seat can be pulled down over them. This roller shade construction is much the same as that of the familiar roll top desk.



Cadillac limousine purple velour interior—D-shaped windows on the sides and oval rear window

The foreign coach work also shows the use of inlaid wood panels within the closed cars and some of the open ones as well, while only a few instances of this are to be seen at the Palace. A Moore and Munger body on a de Dion has wide elaborately inlaid panels extending from the glass almost to the bottom of the doors. These are a most attractive feature, but it is doubtful if they are as serviceable as regular upholstering, since once they get scratched they become unsightly.



Minerva disappearing seat of the D'Eiteren body—when closed this seat construction is flush with the deck. This is a common-sense idea which cannot but become popular

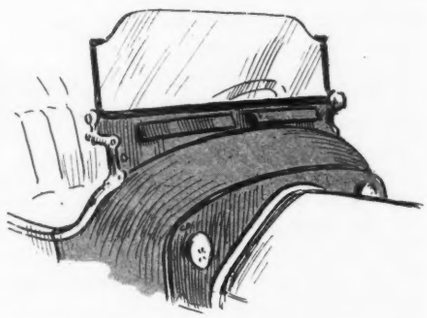
Doors on both open and closed cars are wider and admit of easier entrance and egress. This point was overlooked for several seasons, but the body builder is wide awake to every point these days.

At the Palace there are several electrics exhibiting which reveal some very fine coach work of the American type. Several show cars in unusual colors are shown, the most elaborate being a Waverley coach in gold, which is upholstered in old rose brocade. The seats are staggared at the rear, while there is a single front seat facing backwards on the right side.

Electric Cars Exhibited

Detroit has some fine examples of finish and genteel coach work which would do credit to any body builder.

Baker is showing a light green coupe which is upholstered in brown broadcloth and also a gold and white car upholstered in light gold silk brocade.



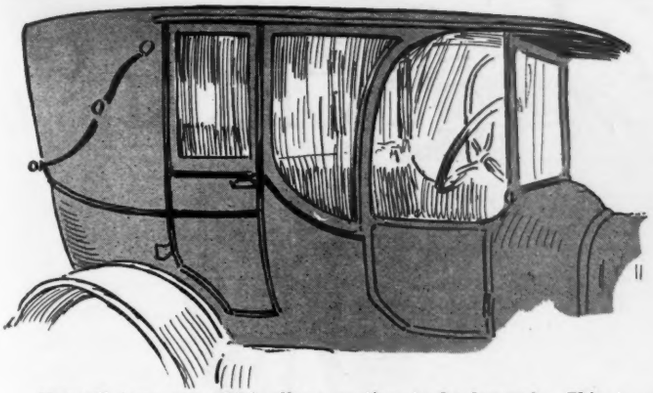
Willys-Knight with ventilating slats—unusual shape to glass, no top moulding

Ward, a newcomer, is showing a rather new design of coupe which has a large amount of glass making for easy view all around.

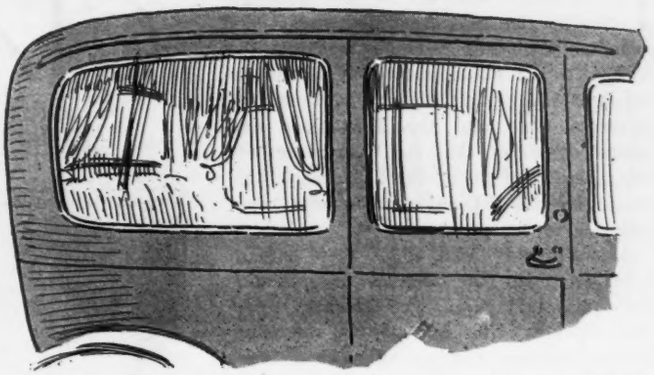
Electric Body Work

There is not much alteration in the general body lines of the average electric coupe, although convenience in seating has been given even greater consideration. Electrics always have been luxuriously fitted and beautifully finished. They have set a high standard for body work which is still being strictly adhered to by coach builders.

Mention should be made here of some of the new Brewster creations which are to be seen at the salon. There is a tendency by this famous maker to revert to old types in some instances. An example of this is a coach fitted to a Delaunay-Belleville chassis. This car in design goes back to the days before the colonial and reminds one of the post chaises of our ancestors.



Maxwell town car which allows portion to be lowered. This is a well-designed closed car and shows the possibilities of coach work for low-priced cars



Much glass is used in the Winton sedan. Note width of windows and attractive shape

Cyclecar Proves Its Worth in Strenuous Road Test

Imp Driven from Detroit to Erie, 280 Miles En Route to New York—Four-Foot Snowfall Stops Enthusiasts—Hughes Checks In

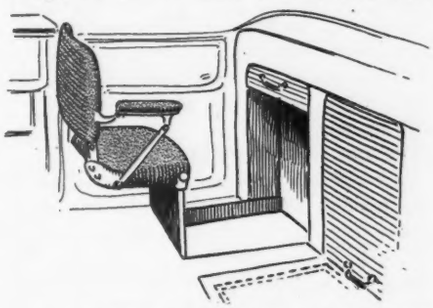
NEW YORK, Jan. 5—The overland trip of the Imp cyclecar from Detroit to New York ended at Erie, Pa., yesterday on account of the worst blizzard northern Pennsylvania has had for several years, according to the report of W. B. Stout, of Chicago, who reached this city today. Fences were buried under 4 feet of snow, wires were down, and of course the roads were impassable.

On the Road 5 Days

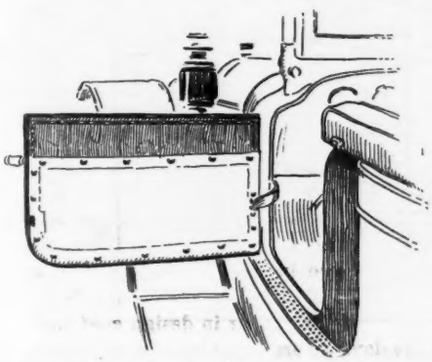
Stout was making the Detroit-New York run in the Imp to determine whether the little narrow-tread, friction and belt-drive vehicles could be depended on to navigate rough and muddy roads as well as their larger brothers of more power. The cyclecar left Detroit December 30 and arrived at Erie, 280 miles away, after 5 days elapsed time and in less than 36 hours running time. "We started from Detroit Tuesday noon, laid over a day and a half at Cleveland waiting for luggage to catch up, and yet arrived at our journey's end just out of this city at snowbank 23 Saturday at 5 o'clock," said Stout today. "Our average running was under 6 hours a day and with such road conditions that outside of cities and macadam roads we did not meet one single motor car between Detroit and Erie. Our cyclecar, which ordinarily makes about 35 miles per gallon of gasoline, averaged about 16 on this trip, which gives another idea of the execrable road conditions.

"In all this trip the belts did not slip once, though after bursting the pulley flange we ran 38 miles on one belt with 4 miles of low gear pulling and two bad hills included. The one belt took the low gear load without a slip, and this was so slack as to hang over an inch loose when standing still. From Detroit to the end of the trip in spite of the heavy pulling the belts were not tightened once and the tires, with the original air in them, show no sign of wear. The motor and indeed the whole car is in even better shape than when we left Detroit and if the blizzard had not made the roads absolutely impassable we would have pulled into New York without doubt.

"In spite of the fact that the car was shipped back before the completion of its scheduled trip, it made an exceptional showing. It is in as good condition as at the start and the only breakages on the run were two front pulley flanges. Road conditions were such as to give the little car a thorough tryout as to ruggedness and ability to negotiate mud.



How Holbrook stores away the extra seats in deDion boat body. Roll covers of wood pull down over seats when folded into recesses in back of front seat



Wide doors on Lancia—also wood panel at top

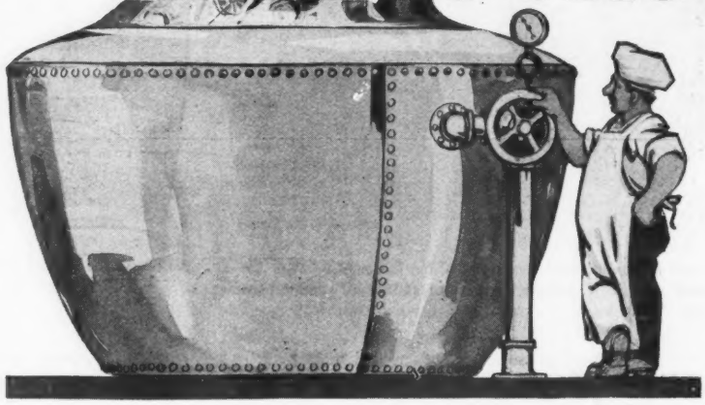
"This trip has proved a number of things. It has proved the 36-inch tread is applicable to American roads. It has proved the reliability of friction and belt drive and that the belts will run in wet, in snow, in mud, and, if long, on small pulleys. It has shown an advantage of many gear ratios with an air-cooled motor, and has proved that the cyclecar is a real vehicle capable even now of great reliability. It has shown also the great advantage of tandem-seating for touring work and comfort, for we carried top and windshield and all directly against the driving blizzard in 6 to 11 inches of snow and often on high gear at that. By letting the heat from the motor back into the car we were warm at all times."

Hughes Also Reaches New York

New York, Jan. 7.—Special telegram—Hughie Hughes, driving a Zip cyclecar, arrived here today, completing a run from Chicago with the exception that the car was shipped from Ashtabula, O., to New York because the car could not negotiate the deep snows and its average running time for the trip was 16 miles per hour. From Toledo, a distance of 280 miles only 7 gallons of gasoline were used. This is an average of 40 miles per gallon. This is car is on exhibition at the Palace. There were no mishaps and no parts broken.

Divided rear seat of Stearns-Knight showing unusual design of upholstery which is a soft black morocco leather

The Essence of the



IF we could take all of the passenger cars on the 1914 American market and combine them into a single machine—this composite car would just about be the one represented in the phantom view on the opposite page and the dimensions and specifications of that car that represents the average of all of the 236 chassis produced by the 133 makers who offer these vehicles to the purchaser.

If we would distill all of these cars in some vast vat the product of this distillation would be the true essence of the 1914 market. This average car would be a five-passenger touring car with a four-cylinder motor, whose cylinders are of the L-head type, cast in a single block. The engine would have a bore of 4.12 inches and a stroke of 5.28 inches, its S. A. E. horsepower rating would be 13.22, and its piston displacement would be 349 cubic inches. Ignition would be of the dual type, oiling by constant level splash and it would be equipped with an electric starting and lighting system with the starter motor driving through gears cut in the flywheel.

Running Gear Details

The car would have a multiple-disk clutch, a selective three-speed gearset in unit with the motor, three-quarter rear springs and a floating axle with a gear ratio of 3.06-1. The tires would be 35 by 4½ inches in size, demountable Q. D. rims and the wheelbase would be 121 inches. The driver would be seated on the left with thhe gearset levers in the center. This car would be listed at $2,635, a rather higher price than that of the average cars of previous years.

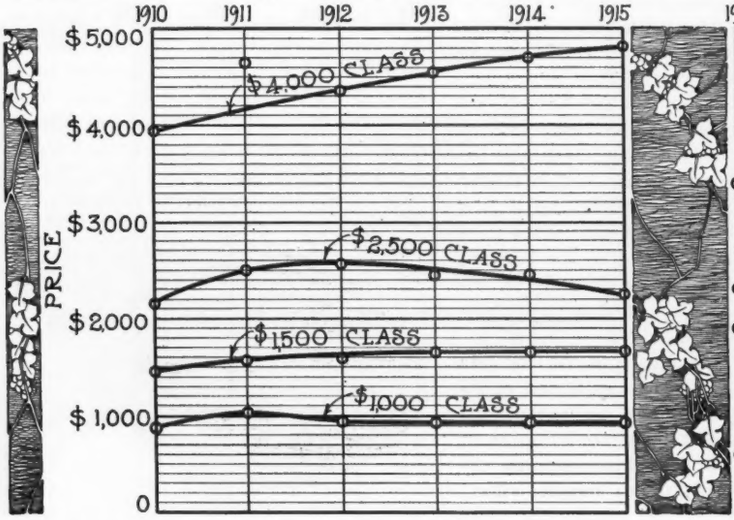
A comparison of the prices of the average car for 5 years would show a steady increase ever since 1910. On page 12 of the January 1 issue is printed a table comparing the features of the average American car of 1914, 1913, 1912, 1911, and 1910 and it is from these figures that the essence of the American market is obtained. The price of the average car this year is $50 more than that of 1913, which is due to two causes. The chief cause is the fact that this average price is based on almost as many six-cylinder cars as four-cylinder as there are 45 per cent of the chassis fitted with six-cylinder motors and 54 per cent with four cylinder motors, the remaining 2 per cent being represented by the two-cylinder cars offered this year; consequently when we say the average car is a four-cylinder we only are a little more than half correct. The other cause for the higher price this year is the increase in equipment, particularly the electric system which adds probably $150 to the price. Without considering the equipment the car would be cheaper than that of the preceding seasons.

Foresight in Calculations

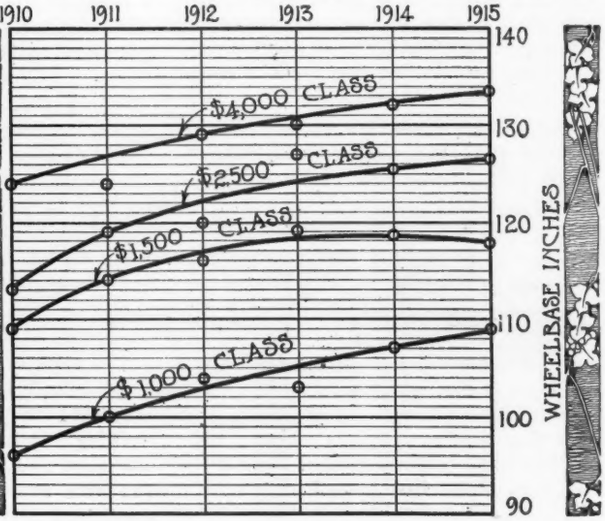
There are a number of cases in which the average design shown from this composite 1914 car is not completely true because a certain feature is given the car owing to the preponderance of chassis using this feature. For instance in the case of the method of casting the cylinders which we have said were cast in block. In reality only 39 per cent of the cars at this time have cylinders cast as a unit, while 42 per cent have them cast in pairs, the remainder of the 100 per cent being divided between the separate casting and the casting in threes of many of the six-cylinder cars. However, the trend towards the block casting is very strong and it is safe to assume that before the year is out the preponderance will be in favor of the block arrangement.

Cars Divided into Classes

It hardly is fair, however, to lump all of the cars together for the consideration of the 1914 cars and their development of those of the past. It is better to divide them up in classes in which those which come within the limits of pocket books of different degrees of opulence may be grouped together, but for this reason Motor Age for the last 5 years has established arbitrary limits for the four classifications, based on price alone. The first class has been called the $1,000 class and comprises all cars listed at $1,250 or less with stock equipment. The next class, which we will call the $1,500 car, includes those listed between $1,250 and $2,000. The $2,500 car embraces those selling between $2,000 and $3,000 while the $4,000 class includes all

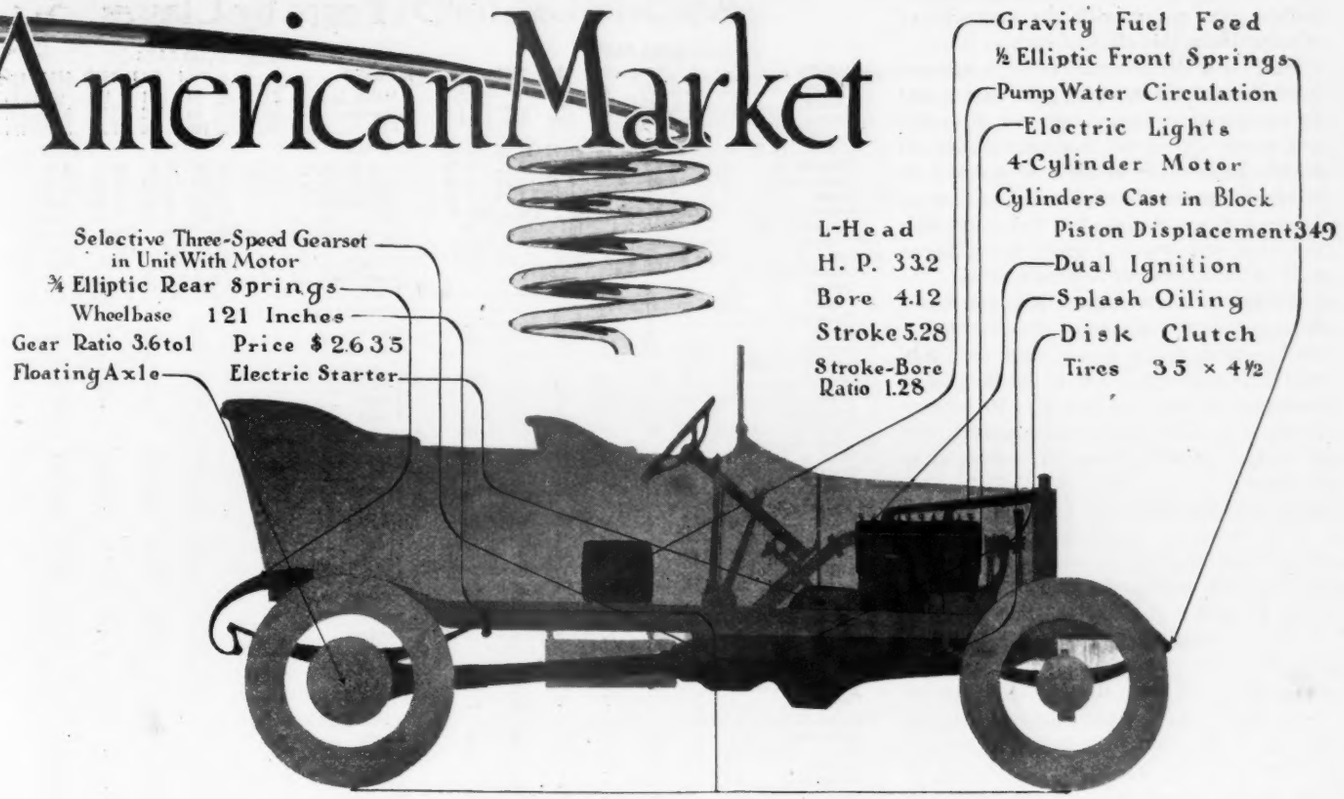


Average prices of American cars for the past four years and the prediction for 1915



Showing the rise in wheelbase in all the classes but the $1,500 which will have a lower average for 1915

American Market



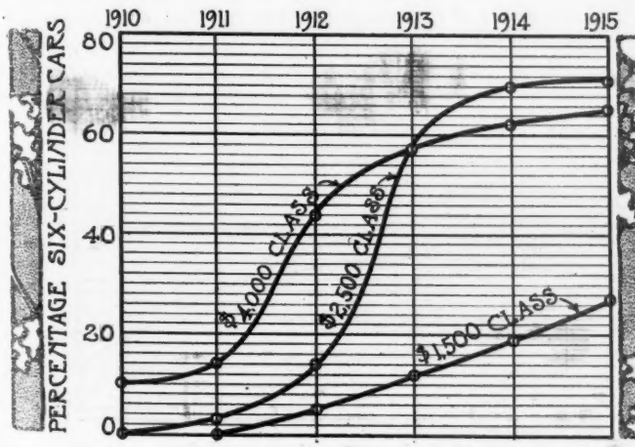
MECHANICAL DETAILS OF THE AVERAGE AMERICAN CAR FOR 1914

those cars selling at $3,000 and over.

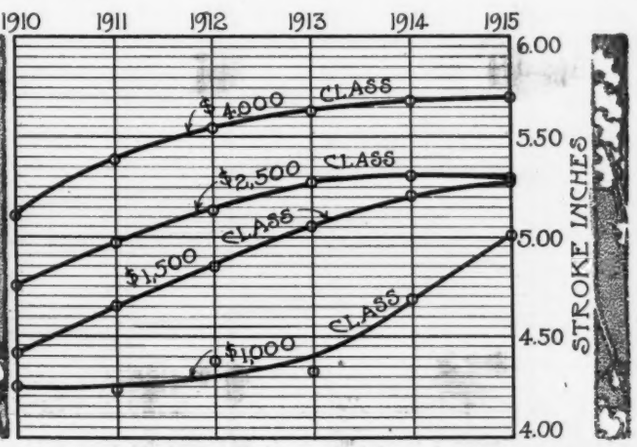
If we consider the $1,000 car first we will find that although it has a smaller horsepower than ever before, it is a larger and a more powerful machine than any average $1,000 car previously. This seeming contradiction is due to the simulataneous decrease in the cylinder bore and increase in the piston stroke. Last year the average car of this class had a cylinder bore of 3.75 inches, while this year the bore is only 3.72 inches. This reduces the horsepower rating from 21.86 in 1913 to 21.04. The stroke, however, has increased even more rapidly than the bore has decreased. Last year the stroke was 4.32 inches, while this year it is 4.69 inches. This means an increase in piston displacement and consequently in the actual power delivered on the basis of cylinder volume alone, aside from the fact that a better design of this year's cars would permit a development of slightly more power on test even with the same cylinder dimensions. The car is a larger one also in carrying capacity, the average wheelbase having increased to 107 inches, which is 4 inches greater than that of last year. There is one feature, however, in which the average car of this class is showing a retrogression rather than an advance. This is in the matter of tire equipment. The tires remain at 32 by 3½ inches which is the same as those of last year in spite of the fact that the weight of the car has been increased considerably due to the almost universal addition of the lighting and cranking equipment.

The percentage of L-head cylinders has jumped from 69 in 1913 to 82. The block casting has shown the greatest jump of any feature in this class, rising from 38 in 1913 to 67 this year. Pump cooling has suffered dropping from 29 to 15 per cent also the air-cooling has lost the most in this class, showing a reduction from 19 to 8. Thermo-syphon circulation of water benefits from the defection from the other two features and has risen from 52 per cent to 76 per cent. The combination of splash and pressure oiling has jumped from 24 per cent in 1913 to 40 per cent, with splash oiling and the two-cycle method of feeding the oil in the fuel have shown a corresponding decrease.

One of the features which stands out on this car is the rise in popularity of single ignition, 55 per cent of the $1,000 cars having but one source of ignition, whereas only 43 per cent had this system last year. This is due to the electric cranking



Percentage of six-cylinder motors for five years and how the $2,500 will eclipse the $4,000 in 1915



Prediction for 1915 regarding the average stroke in the various classes and the figures for past years

and lighting system which many makers believe does away with the necessity of a magneto on this class of cars.

Of course the electric cranking systems hold the palm for rapid gain among the features in this class. Last year there was not a car selling at less than $1,250 to which an electric cranker was fitted as stock equipment; this year 61 per cent of them are so equipped. The acetylene cranking system has dropped from 19 per cent in 1913 to 3 per cent this year.

All in all, the average $1,000 car would have specifications reading something like this: Price, $950; motor four cylinders of the L-head type cast in block with a bore of 3.72 and a stroke of 4.69 inches; horsepower 21.4; piston displacement, 195 cubic inches; wheelbase, 107 inches; tires 32 by 3½.

Cars in $1,500 Class

Proceeding to the cars listed between $1,250 and $2,000, we find a trend along similar lines among the $1,000 cars. The chief feature is the increase in popularity of the six from 12 per cent in 1913 to 19 per cent this year. The cylinder shape shows a rather unusual state of affairs in this class, the T-head cylinders having gained 13 per cent over last year to the detriment of the L-head type, although of course, the L-head cylinder has twice the popularity that the T-head has. Block casting shows a slight rise as does pump cooling. Electric crankers almost monopolize the field, having 96 per cent following, whereas there only were 38 last year. Air starting has 3 per cent this year as against 4 per cent last, while the acetyline starting has lost out completely, although it had 18 per cent adherents last year.

The $1,500 car as a whole would have these specifications: Price, $1,650; motor, L-head cylinders cast in block, having a bore of 4.07 and a stroke of 5.18 inches giving it a horsepower rating of 28.6 and a displacement of 300 cubic inches. Its wheelbase would be 118½ inches and tires 34 by 4.

The average $2,500 car has a six-cylinder motor of 4.03 inches bore and 5.29 stroke, its horsepower rating is 35.2 and its displacement 378.5 cubic inches, its wheelbase is almost 126 and its tires are 35 by 4½. It lists at $2,460 which is $50 more than the price of the corresponding car last year. The feature of this class is the enormous increase in the number of sixes, the percentage rising from 57 in 1913 to 70 in 1914. L-head cylinders likewise show an exceptional gain, rising from 47 last year to 52 per cent this year. The method of casting cylinders if pretty evenly divided among the threes, pairs and block castings, the first having 29, the second 39, and the third 29 per cent of the field. Separate casting has dropped from 11 to 3 per cent. The percentage of air crankers is rather high in this class as it is in the $1,500 class because of the influence of the air-cranker which is offered on 5 per cent of the chassis while another 2 per cent provide a choice of air or electric.

In the cars of the highest class, those listing over $3,000, the average has a price of $4,700, it has a six-cylinder motor of 40.5 horsepower, its cylinders are the L-head type, cast in pairs and have a bore of 4.46 inches and a stroke of 5.68. Its wheelbase is 132 inches, 2 inches greater than last year and its tires are 36 by 5. The L-head cylinder displaces the T-head this year in the estimation of the makers, the L-head rising from 36 to 42 per cent while the T-head shows a corresponding drop from 41 to 37 per cent.

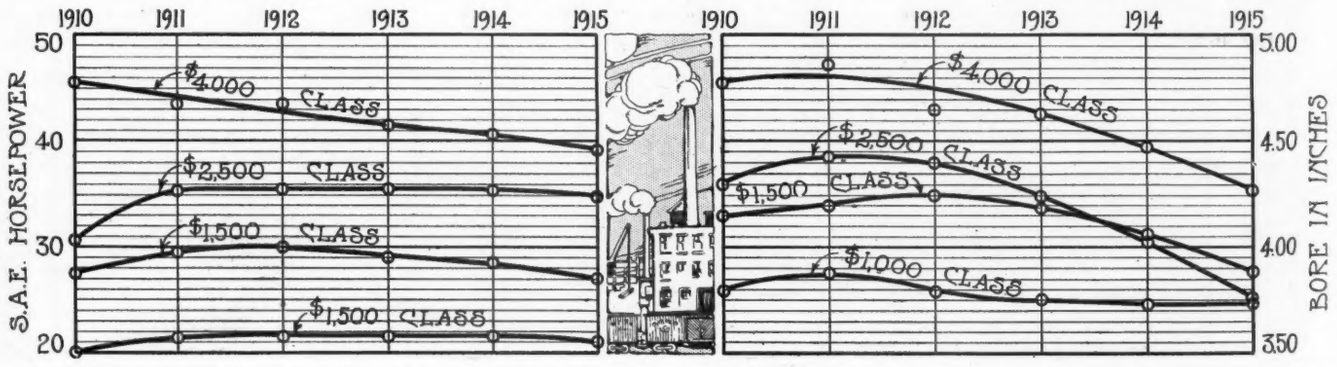
Prognostications for 1915

While Motor Age has been telling each year just what the car of the following season will be—the important mechanical features, with price and so on, it must not be taken for granted that the statements made in this connection are given as tips but are simply to be considered as a prophecy, for the data given is obtained from figures on file. The predictions are made in a systematic way, based on the present rate of increase or decline, but not in any way on statements made by

Average Car for 5 Years by Classes

$1,000 CARS	1914	1913	1912	1911	1910
NUMBER					
Makes	35	32	56	52	43
Chassis	50	42	65	76	72
Cars	60	76	130	136	114
AVERAGE					
S. A. E., H. P.	21.4	21.86	21.18	21.23	19.85
Bore, in.	3.72	3.75	3.78	4.01	3.79
Stroke, in.	4.69	4.32	4.37	4.21	4.25
Ratio	1.26	1.15	1.15	1.05	1.12
Piston disp.	195.0	178.0	186.2	185.8	164.5
Wheelbase, in.	107	103	104	100	96
Tires, in.	32x3½	32x3½	32x3½	32x3	32x3
Price	$950	$920	$954	$1,002	$879
PERCENTAGE					
One cyl.	0	0	1		
Two cyl.	11	19	10		
Three cyl.	0	0	2		
Six cyl.	0	0	0		
Four cyl.	89	81	87		
CYLINDER SHAPE					
1-head cyl.	12	14	5	10	17
2-cycle cyl.	1	12	14	6	0
T-head cyl.	3	5	7	11	13
L-head cyl.	82	69	74	73	70
HOW CAST					
Block	67	38	31	27	12
Separate	13	31	37	40	52
Pair	20	31	32	33	36
COOLING					
Pump	16	29	39	24	30
Air	8	19	13	15	4
Thermo-Syphon	76	52	48	61	66
OILING					
Splash	57	64	79	68	85
Splash-pres.	40	24	11	32	15
Pressure	2	2	0	0	0
In fuel	1	10	10	0	0
IGNITION					
Dual	40	50	60	48	40
Single	55	43	38	39	45
Double	5	7	2	13	15
ENGINE STARTER TYPE					
Acetylene	3	19	20	0	0
Elec.	61	0	0	0	0
Optional	0	2	0	0	0
Mechanical	3	9	5	0	0
None	10	70	75	100	100
Extra	23	0	0	0	0

$1,500 CARS	1914	1913	1912	1911	1910
NUMBER					
Makes	54	81	86	86	75
Chassis	84	112	122	125	102
Cars	136	238	257	298	174
AVERAGE					
S. A. E., H. P.	28.6	28.9	30.01	29.53	27.20
Bore, in.	4.07	4.18	4.26	4.19	4.14
Stroke, in.	5.18	5.05	4.86	4.64	4.41
Ratio	1.27	1.20	1.14	1.10	1.06
Piston disp.	300.	295.	266.5	262.0	238.
Wheelbase, in.	118.5	119.	116.	114.	109.
Tires, in.	34x4	34x4	34x4	34x4	34x4
Gear Ratio	3.7-1	3.61-1			
Price	$1,650	$1,662	$1,595	$1,585	$1,430
PERCENTAGE					
Four cyl.	81	88	95		
Six cyl.	19	12	5		
CYLINDER SHAPE					
L-Head	66	75	78	70	87
T-head	34	21	15	12	10
I-head	0			18	3
HOW CAST					
Pairs	42	38	45	60	18
Block	49	45	30	19	24
Separate	6	15	24	21	58
Threes	3	2	1	0	0
COOLING					
Pump	86	74	66	49	50
Thermo-Syphon	14	24	31	48	42
Air	0	2	3	3	8
IGNITION SYSTEM					
Dual	77	78	75	67	49
Double	10	12	13	17	43
Single	13	10	12	16	8
FUEL FEED					
Gravity	70	81	90	93	81
Pressure	30	19	10	7	19
ENGINE STARTER TYPE					
Electric	96	38		0	0
Optional	1	8	0	0	0
Acetylene	0	18	9	0	0
Air	3	4	2	0	0
Mechanical	0	1	2	1	0
No Starter	0	31	85	99	100



The gradual drop in the average S. A. E. horsepower since 1911 and the low figures expected in 1915

The curves show a tendency for the average bore to become still smaller for 1915

Average Car for 5 Years by Classes

$2,500 CARS	1914	1913	1912	1911	1910
NUMBER					
Makes	60	79	74	70	63
Chassis	102	93	82	76	83
Cars	170	235	216	234	159
AVERAGE					
H. P.	35.2	35.90	35.45	35.60	30.65
Bore, in.	4.03	4.23	4.40	4.43	4.31
Stroke, in.	5.29	5.27	5.00	4.96	4.75
Ratio	1.31	1.25	1.13	1.12	1.07
Pist. disp.	378.5	372.00	336.5	324.2	287.9
Wheelbase	125.8	127.	120.	119.	113.
Tires	35x4½	36x4½	36x4¼	35x4	34x4
Price	$2 460	$2,410	$2,570	$2,490	$2,14
PERCENTAGE					
Four-Cyl	30	43	86		
Six-Cyl	70	57	14		
CYLINDER SHAPE					
T-head	34	45	44	28	26
L-head	62	47	50	57	57
I-head	3	8	6	15	17
Knight	1	0	0	0	0
HOW CAST					
Threes	29	20	6	0	0
Pairs	39	46	68	67	58
Block	29	23	11	4	10
Separate	3	11	15	29	32
COOLING					
Pump	91	89	97	94	70
Thermo-Syphon	7	9	1	3	25
Air	2	2	2	3	5
IGNITION					
Dual	57	72	61	50	32
2-Spark	2	3	0	0	0
Single	33	10	6	10	29
Double	8	15	33	40	39
ENGINE STARTER TYPE					
Air	5	16	2	1	1
Elec.	93	46	2	0	0
Acet.	0	7	10	0	0
Mechanical	0	4	6	2	0
Opt.	2	4	0	0	0
None	0	23	80	97	99

$4,000 CARS	1914	1913	1912	1911	1910
NUMBER					
Makes	46	58	84	62	58
Chassis	72	92	112	116	107
Cars	247	359	525	395	230
AVERAGE					
H. P.	40.50	41.70	43.40	43.66	46.65
Bore, in.	4.46	4.63	4.65	4.87	4.76
Stroke, in.	5.68	5.62	5.41	5.39	5.11
Ratio	1.28	1.21	1.16	1.10	1.07
Pist. disp.	475.0	453.0	453.0	447.3	436.5
Wheelbase	132.0	130.	129.	124.	124.
Tires	36x5	37x5	36x4½	37x5	36x4
Price	$4,700	$4,550	$4,350	$4,650	$3,917
PERCENTAGE					
Four-Cyl	38	42	55	0	0
Six-Cyl	62	57	44	0	0
Five-Cyl	0	1	1	0	0
CYLINDER SHAPE					
I-head	13	13	15	27	17
2 cycle	0	0	1	1	4
T-head	37	41	42	34	53
L-head	42	36	34	38	26
Knight	8	10	8	0	0
HOW CAST					
Separate	14	12	18	20	25
Pairs	58	71	74	79	74
Block	10	10	5	1	1
Threes	18	7	3	0	0
COOLING					
Pump	98	96	94	95	94
Air	0	3	3	4	4
Thermo-Syphon	2	1	3	1	2
LUBRICATION SYSTEM					
Pressure	38	30	38	26	15
Spl-pres.	37	38	0	0	0
Splash	27	32	62	74	85
IGNITION SYSTEM					
Dual	47	56	50	50	39
Single	15	12	9	7	12
Double	23	25	41	43	49
2 Pt.	8	7	0	0	0
Duplex	7	0	0	0	0
ENGINE STARTER TYPE					
None	0	20	80	95	98
Acet.	0	16	10	0	0
Lever	0	1	0	1	0
Elect.	96	41	2	0	0
Mechanical	0	8	5	2	0
Air	4	14	3	2	2

the manufacturers as to future practice, for example in 1913 in the January 9 issue the prophet told that the wheelbase of the $4,000 car for 1914 would be 132 inches. The data on this page shows that this is exactly the average wheelbase of all the cars in the $4,000 class.

It is borne in mind that no power on earth can tell what changes the future will seek, but by careful calculation it can be shown that at the present rate of progress or decline certain conditions will prevail in later years. In representing these figures graphically the use of cross section paper makes this a simple matter. The vertical lines are made to represent the different years, while the horizontal lines show the various car characteristics. Take the horsepower curve of the $4,000 class as an example. The average horsepower of this class was 46.5 in 1910. A point is marked on the line representing 1910, at a height representing 46.5. In 1911 the average horsepower of this class was 45. This figure is looked for on the horizontal lines and a point made at the intersection of this line with the vertical line representing 1911. The same thing is done with the 1912 and 1913 figure. In 1914 it is 40.5 and in 1915 it will be 30.9.

The points on the plotting or cross section paper are fou or more in number, one at a point on the 1910 line, another on the 1911 and another on the 1912, 1913, etc. These points may or may not lie in a straight line, but if connected the line resulting will show the tendencies for the years represented. There is no abrupt change in any form of enterprise so there will be no angles in any of these diagrams, but a curved line will result.

The figures for 5 years being in the form of a curve, any prolongation of the curve will show the tendencies for the future. Where the curve crosses the line representing 1915 it means that at the former rate of increase or decline the figure represented by the point of intersection will be the approximate average horsepower in 1915. In the case of the horsepower curve the prolonged line intersects the 1915 line at 39.0, which means that should the horsepower continue to decrease as it has, in 1915 the average car of the $4,000 class will have 39 horsepower. All the curves have been plotted with the fundamental idea that the present rate of advance or drop will continue until 1915.

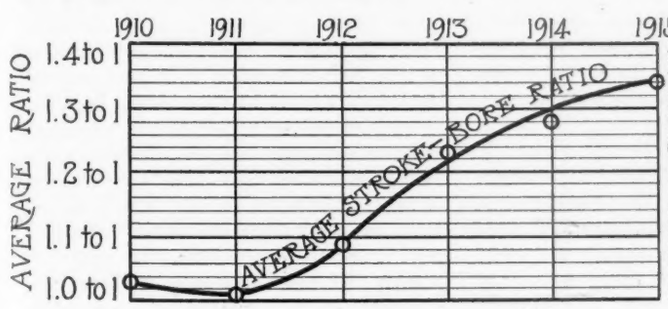
In no instance is the S. A. E. horsepower average tending upward. The $4,000 class, if the curves on page 34 are noted, has made a greater drop than any of the other division while the $1,500 class has made little if any progress toward the foreign low horsepower ideal. This is due primarily to the fact that this class is composed of four-cylinder cars of low displacement and there is no necessity of dropping the power very much lower than it is. It is to be expected that the small car field will have a constant average horsepower for some time to come.

Smaller Bore Predicted

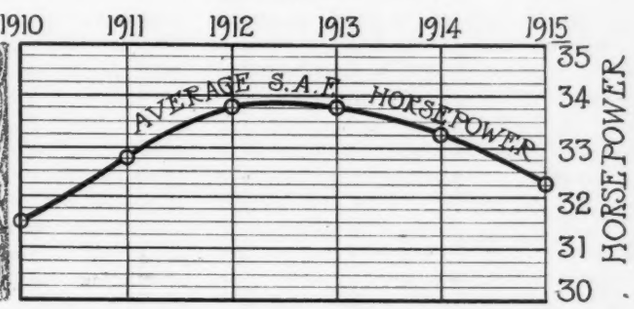
The gradual drop in horsepower in the other classes may be directly attributed to the tendency toward the small bore, the curves of which show an acute turn in 1911 and since then a gradual drop to the present low figures. From the curves shown on page 34 it is predicted that in 1915 the average bore of the $1,000 will be equal to that of the $2,500 class, the figure to be 3.75 inches.

It is fair to assume that in 1915 more than 60 per cent of the cars in the $4,000 class will have six-cylinder motors and that the $2,500 class will show a far greater percentage of such cars. As the curves show, it will be some time before the $1,500 cars will have as great a six-cylinder representation as the other classes and that the $1,000 class has not yet begun on its climb for honors in the six-cylinder field.

The curves plotted for the price of the cars of the different classes are rather interesting and show that the $4,000 car will cost more in 1915 than it has in any previous year. Forty-nine hundred dollars will be the price asked for the average car of this class. In only one instance does the prophet tell us the price will go down, and that is in the $2,500 class which the curves say will show an average price of about $2,200 in 1915.



Curve showing the average stroke-bore ratio of all the cars on the market for five years with a 1915 prediction



Showing how the average car will drop in horsepower in 1915 and the high mark between 1912 and 1913

Fitments for the Motor Car

Trends in Accessories for 1914

By Harry A. Tarantous

AS equipment has been a dominant feature of the cars of 1913, so it will receive the greater share of the laurels for 1914. The majority of the makers of motor cars have paid as much attention to the accessories attached to the cars as they have to the cars themselves and at the same time have not overlooked the car's refinements. More accessory makers have entered the motor industry than ever before and each and every one seems to have prospered.

Electric cranking and lighting have been given more attention than the rest of the accessories combined. The wonderful growth of the electric cranking system perhaps is best realized when it is stated that this year sees the abnormal rise of 50 per cent over 1913. In that year but 37 per cent of the cars had electric cranking while 1914 has 87 per cent so equipped.

The successful invasion of the electric cranker has meant the development of a subsidiary industry, in fact the greater number of electric apparatus makers either have marketed or will offer some type of cranker. When first introduced, these crankers were crude, to be sure, but the designers have worked diligently to make the cranking systems foolproof and troubleproof.

Cranking Systems Simplified

In past practice the complicated wiring, large fuse boxes and bulky terminal blocks were a menace but such advances have been made that now the electric cranking system is about on a par with the simplified ignition so hard sought. Nothing radical has taken place, the changes in the cranking systems all tending toward simplicity of construction, greater efficiency and less bulk. Rather than have large motors of low speed with no intermediate gearing, most makers have adopted the small high-speed cranking motor with intermediate gearing. The wiring to and from the motors, generators and fuse boxes, etc., has been simplified so that the average owner can by a reasonable amount of attention trace all the circuits with the aid of a wiring diagram, which is supplied by the maker. Current regulation has been given a great deal of attention, and now the owner need not fear that the battery will be overcharged. The compactness of the 1914 installations is worthy of note; weight reduction, an important factor, has been carefully considered, and the present cranking systems are more efficient, lighter, smaller in size, and better adapted to the particular vehicle upon which they appear than the systems of a year ago. The generators which are used for furnishing current to the cranking motor and for recharging the battery have received the same attention as the motors.

Leece-Neville, Northeast and others have come out with special cranking and lighting systems for Ford cars and other small vehicles and the onrush for these installations has caused other makers to seriously consider the small car owner's demand.

The three systems on the market last year, the one, two and three-unit, still may be seen, a slight tendency being noted toward the two and three-unit system, while the single unit has not made any tremendous advancement. The lighting generators have been made quick-removable and although special instructions apply usually to each type the average repairman or even the owner can with ordinary care remove and install an entire system. A new type of lighting generator has made its way to the field, it being known as the Kemco fan generator because it is incorporated with the cooling fan of the motor.

Improvements in Lighting

Along with the tremendous rise and popularity of electric cranking has come a corresponding increase in electric lighting systems. Acetylene lighting has not been forgotten, for accessory makers have turned out devices for lighting the acetylene lights from the seat, in one instance the magneto current being used to give the necessary initial heat.

Local legislation in a majority of the big cities has resulted in the prohibiting of glaring headlights. This has caused accessory manufacturers to offer various contrivances for eliminating glare. Small bulbs incorporated with the headlights are popular while dimmers are numerous.. Lamp shades and colored or milk glass also have met with great approval. The latest development in the matter of non-glare devices is the introduction of amber lenses which is said to be efficient also to permit the light to pierce fog. It may be said in this connection that the tail light laws have caused to be produced combination rear lights and license brackets so that the pad may be seen at night at a distance required by law. Dash lamps, step lights and trouble lights are seen as stock equipment on more cars this year than ever before.

One of the most radical changes of the year has been the adoption of the automatic gearshift which is one indication of the progressiveness and initiative of American engineers. Only one firm has come forward with an electric gearshift, the Vulcan Mfg. Co., whose system is called the Vulcan and now is to be seen on the Haynes, S. G. V., Norwalk and Pullman cars, while a number of others are seriously considering its adoption. Elwood Haynes, Alexander Winton, and the rest of our worthy pioneers little realized that today pressure on a button would send the car from first to second

TREND IN ACCESSORIES

THE introduction of the electric gearshift has been the most startling development of the year, while the most recent convert to electrification has been the braking system of the motor car. Cranking and lighting systems have been brought to a finer point mechanically, the regulation has been improved upon, the weight reduced and the size of the installations made smaller.

Price reductions are to be noted in a great number of instances and from present indications a further drop may be expected. This drop in price is characteristic of such accessories as tires, horns, and tire sundries.

The plain-tread tire seems to be leaving the field, thus giving way to the non-skid which appears in a greater variety of forms.

A pneumatic speedometer has edged into the accessory field and an inclosed type of speedometer drive announced which is incorporated in the wheel spindle.

A few makers of electric horns announce new hand-operated types. Horns which give the sound of an electric but which are mechanically operated, are features.

One-man tops are given as stock equipment by more car makers. The stay-in-the-seat type now is a stable accessory.

Vulcanizers, tire pumps, both geared and of the spark-pump type are numerous and many new manufacturers have been attracted to the market. Tire signals which whistle or ring a bell when a tire is about to become deflated have come in and met with no little approval.

Economizers and primers are top-notchers when numbers are considered, and with the low grade and high price of fuel they have been welcomed by motor car owners.

Removing carbon with oxygen has brought a number of new apparatus makers to the industry.

More Ford accessories than ever before in the history of the industry.

and second to high—the work of electricity stored up in a battery.

Although the electric gearshift is in use as stock equipment on the cars mentioned above, the Gray pneumatic gearshift has a number of admirers from its ability to perform a number of other things aside from gear-shifting. The Gray system pumps the tires, supplies air for the gasoline tank, cranks the motor, and can perform any other operation requiring air as an agent. Besides the air and electric a mechanical gearshift has made its way to the market, the newcomer being known as the Colson which is operated by a series of pedals.

Up-to-the-minute development in motor car accessories is the electric brake evolved by E. V. Hartford of the Hartford Suspension Co. This device is small, simple in construction and is operated by a lever on the steering wheel. The brakes may be applied gently or harshly according as the movement of the lever.

Non-Skids Aplenty

A noted change in the tire market has been the gradual retreat of the plain tread which has given way to the non-skid tread. The variety of treads offered is much greater than in former years, and the wearing qualities bettered considerably. Rubber has gone down in price, the quality has gone up, and the price to the consumer has been decreased at every opportunity. The use of oversized tires has come to be realized by the owner as a saving ultimately and more than ever before has this type come into general use, many owners substituting oversized for regular immediately upon receipt of their cars when the vehicle is not oversize-equipped. More car manufacturers are stock-equipping with oversize tires. Owing to the special demands of the small car a number of tire manufacturers have built special types, the latest to this field being the Republic people, who have introduced the W. M. tread. The use of straight-side tires is becoming more popular than before.

The detachable tread introduced by the Goodyear company is an innovation which has met with much approval. This tire has a separate carcass and tread, so that when the tread is worn completely the carcass still may be used and the cost of a new tire cut in half practically. Unusual construction which prevents rim-cutting and many other conditions is to be seen in the Federal double-cable base tire. Two cables run through the bead which is flexible.

The enormous demand for tire accessories such as pumps, vulcanizers, alarms, patches and interliners has brought a great number of new makers to the already long list, perhaps the most important and unexpected invader being the Stewart Warner Speedometer Co., which has come forward with a line of all-metal motor-driven tire pumps. The Taylor Noil tire pump is another new one which is of peculiar construction which enables it to do, it is claimed, what all makers have been striving for—pump nothing but air to the tires and excludes oil and other foreign matter. This aim has been accomplished by the majority of pump makers. The hand tire pump seems to be a thing of the past. The number of makers of spark plug pumps has not risen very much, but the improvements made have done much toward giving satisfied service. In a number of instances special spark plugs are offered with the pumps so the insertion of the apparatus does not require the unscrewing of the regular plug. A reduction of price is characteristic of the majority of pumps on the market.

Up to this time the driver of a car was dependent upon his sense of feeling for a flat tire and there was no way of ascertaining when a tire was losing air except by continually glancing at the tire. There have been introduced a number of successful tire alarms which tell the driver of the car when the pressure in the tire has dropped below a fixed amount. In one case the device does not enter the inner tube but rests against it. A loss of air causes the signal to give a loud whistling noise, which ceases only when the tire has become completely deflated. With another signal the partial deflation of the tire causes an electric circuit to be closed which in turn sends current to a gong on the dash and thus notifies the driver of trouble.

Portable vulcanizers now are regarded as necessities. The recent introductions permit a casing to be vulcanized on the wheel and fully inflated, the work being automatically controlled. Most of the road vulcanizers are of the fuel-burning type and after placing some gasoline in the container, it is lighted. When the fuel is consumed the repair is supposed to be complete. The big price reduction in road vulcanizers has caused the majority of car owners to take care of their own tires by the use of these simple devices. The portable steam vulcanizer has not dropped behind, in fact the ability of steam to do the work of vulcanization well has caused many to prefer it to the fuel-burning type. The electric type seems to have lost ground.

Many Fuel Economizers

With the fuel question a vitally important one, accessory manufacturers pay no little attention to decreasing the fuel consumption of motors by the attachment of devices known as economizers or fuel-savers. In most instances these consist of regulators which supply the carbureter with the proper amount of air at different speeds. In a number of tests performed it has been shown that in some cases these additions to the car give approximately 20 per cent greater mileage per gallon.

Other than the mechanical devices for decreasing the fuel consumption, a number of liquid additions are offered. These are introduced in certain proportions and are claimed to give greater miles per gallon, more power and at the same time prevent excessive carbonization.

The more extended use of motor cars during the winter months has resulted in the market being flooded with priming devices which make starting easier. These are designed to inject a certain amount of fuel into the intake manifold or cylinder directly and thus give the first spark a combustible rich mixture, making the starter do less work or the man if the hand crank is used. Electric primers have been introduced and have won a number of admirers. These devices take the fuel and thoroughly vaporize it before its introduction into the cylinders, and at the same time supply an over-rich mixture to make the starting easier. The sight feed primer of Webb Jay is an improvement on the primitive type, eliminating the necessity of lifting the hood, and showing whether or not gasoline is flowing to the intake manifold.

Kerosene Carbureters Improved

Kerosene carbureters also have appeared and more than ever before have they been so seriously considered since the price of gasoline has risen to its present high point. The development of the carbureter which employs exhaust gas to vaporize the gasoline is on a par with that which uses an electric coil while those employing direct flame obtained from a kerosene burner have received little attention. The trouble of getting the initial start has been overcome largely by the use of gasoline stored in an auxiliary tank. The motor is permitted to run on this a few minutes and when sufficiently heated the gasoline supply is cut off and the kerosene introduced into the carbureter.

Aside from the perfection of kerosene carbureters, those using gasoline have been made more simple and the points of adjustment marked so that any owner now can tune the instrument from instructions received from the maker. Dash air controls are used now on almost every make of car, and owing to the low grade of fuel on the present market, the carbureters have been equipped with hot air intakes and hot water-jackets. These additions have helped wonderfully toward giving better carburetion. Ease of installation is another subject that has been given a great deal of attention, a good example being the Rayfield. This carbureter is so arranged that the fuel intake nozzle may be turned at any angle so that the gasoline pipe need not be bent to line up with the fuel nozzle. The carbureters are higher now than formerly, making the adjustments visible.

Although the magneto receives less attention by the owner than any other part of the motor and has been considered by many in its highest form, the makers of these instruments have in the past year worked desperately toward bringing the finer parts to a point where they will be more efficient. The unseen portions of the magneto are those which have received the most attention. The use of Bakelite

has become almost universal. This substance has high insulating qualities, is less liable to break than hard rubber, and on the whole has been found to give better results than any other substance.

Making the magneto waterproof and dustproof have been other aims which have been accomplished, and in many of the modern instruments no moving parts may be seen. The terminals have been made more secure, as loose wires used to be a common complaint. Two magneto companies are manufacturing tools for making terminals which will do their work better than the common type. Both Eisemann and Bosch are offering terminal tools which in a few minutes place a terminal on the end of a cable or wire which is as secure as if made by some automatic machine.

High-tension Magneto Leads

The use of the separate magneto has suffered slightly owing to the introduction of ignition systems which are used in conjunction with cranking and lighting. The low-tension or transformer type is slowly passing into the discard, and the high-tension soon will be alone in the field. The Splitdorf Electric Co., heretofore an advocate of low-tension magnetos, solely, has come to the market with one of the compound armature type.

Special magnetos for Ford cars are offered for the first time by the large makers, both Bosch and Splitdorf having announced such instruments. This permits of the Ford flywheel being used as lighting generator.

The most important development in the spark plug field has been the extended use of mica as an insulator in order tc prevent breakage and consequent current loss. Porcelain is retained still on the inside of the plug where it is not liable to be broken and where it is found to be best suited to do the work. The use of double plugs which may be placed in series with the regular plug for transforming single spark into two-spark ignition has a wider use than before. The Superior plug and the J. D. are two examples of the double type.

Priming plugs have not won as much favor as they have in former years, due to the more general use of dash priming devices and the ease with which motors may be started without the necessity of lifting the hood. Another development is the visible gap type which has won over another manufacturer. The breech block plug in which the interior may be removed quickly from the threaded portion for priming or the insertion of an impulse tire pump is more in use than before. Aside from the breech-block other special types of plugs are offered which makes the insertion of the pump simple and in a number of instances the maker of the pump offers such a plug. The Mayo is the latest arrival to the special plug field.

In general it may be said that the spark plugs have been made of better material so that the points will not spread so rapidly, the terminals have been so constructed so as to make the removal of the cables simple, and the plugs now show a much longer life and give better service than those offered a year ago.

The introduction of the pneumatic speedometer by the Van Sicklen Speedometer Co. shows a radical departure from the present types. Recording speedometers have come in for their share of admirers and the limit has been attained perhaps in the recent introduction of the coastometer, a device for electric vehicles which records not only the traveled mileage under power, but the mileage negotiated with the control in off position. The driving of the speedometer by inclosed gearing has met with great favor. In the new Cadillac the drive is in the wheel spindle and bevel gears are employed. The Empire drive is the name of this new contrivance which also is used in Timken axles with worm gearing instead of the bevel. This method of drive not only insures quieter running, due to the fact that the drive may be well lubricated, but has the added feature of protecting the drive from dirt.

Driving of the speedometer from other than a front wheel is another innovation. In most instances the driving gear is clamped around the universal joint housing, an example of this being seen in the Apperson car. Careful attention has been given to temperature regulators in the 1914 speedometers so that the readings will be accurate and fluctuating of the indicator eliminated.

Trend in Signals

In the past year a large number of makers of electric horns have come to manufacture horns which give the same effect as the electirc product, yet are operated mechanically. The Klaxon and Spartan now appear in forms which are hand-operated and the Motophone is offered in a type which requires pressure on a button for operation. This does not mean that the electric horn has lost adherents, for never before have so many manufacturers decided to equip with electric horns as stock and eliminate the bulb horn entirely. As with the rest of the car, the electrically-operated devices are in the foreground and the horn operated from the battery perhaps is in greater use than all other types combined.

The great rush on the part of manufacturers to supply special types for Fords is noticeable and the car has brought more than six new makers to the field. In most instances the Ford magneto is used as a source of current. The under-the-hood era has been carried to a very high point this year, the greater number of makers placing the horn in some obscure place. Prices are somewhat lower than a year ago.

Making the car ride easier always has been an inventor's hobby, and this has brought to the field no fewer than five new makers. Hydraulic shock absorbers have come into greater use than in former years, and although the scissors type, which is made by the Hartford Suspension Co., still is in the lead, the barrel design similar to that offered by the J. M. company is fast becoming popular. Foreigners seeing the tremendous demand for a good shock absorber in America have come over with at least one, the A. V., which appears to mark the beginning of an accessory invasion from abroad. This was not due to the tariff reduction, as the A. V. was on the market before the new tariff laws became effective.

The small cars have been given no little attention in the matter of the proper fitting of shock absorbers; most of the large manufacturers offering small car types. The general run of prices is less this year than formerly and from present indications a still lower price may be expected.

Rims Are Simpler

Simplification is the word in demountable rims, simplification not only in construction but in operation. The most important aims of the manufacturer have been the elimination of parts, the rim makers viewing unity from the same angle as motor designers. The Standard Welding Co. has recently brought out a new type of demountable rim which not only is simple in operation but makes for greater security when on the wheel.

It no longer is necessary for a driver to get out of a car to raise or lower the top for the makers of this accessory have so developed the product that a few movements of the arms raises or lowers the top. These one-man tops, although in use for some time, now are more generally given as stock equipment by the motor car makers. Going a step farther than the one-man top, the Sharrer is claimed to require but one hand for operation. Curtains of the Jiffy type which are placed in position quickly soon will be used universally, for the old style get-out-and-fasten type are gradually losing their hold. on the market.

Carbon removers of the oxygen type have had more callers than any other shop accessory. With this system carbon may be removed from a four-cylinder motor in one-fourth the time required by hand scraping, and further the cylinders are not removed from the crankcase. Such a demand has been set up for oxygen carbon removers that no fewer than six makers of this device have been brought to the field.

Another shop accessory which has a large clientele is the spring spreader, which permits of the leaves being separated for the insertion of oil, graphite or grease to prevent squeaking. The latest development to prevent spring squeaking is the Dann insert which is placed between each two leaves and supplies lubricant indefinitely. The most recent necessity in jacks is that which does not require bending down, but is operated by foot; the latest maker of this being the Duff Mfg. Co.

Steel Wheel for Passenger Cars Appears at the Show

Crown Prince, German Idea, Displayed for First Time

THE average motorist nearly always has associated the steel wheel with the heavy motor truck, although several designs have been produced for the use of passenger vehicles. At the New York shows another type of pressed steel wheel for passenger vehicles is revealed to the general public for the first time. This is the Crown Prince wheel which is a German importation, brought to this country about 8 months ago by Max Bachem, who is the sole United States licensee, and who has headquarters in Detroit.

The Crown Prince wheel, which is made to fit any standard straight side, clincher or quick-detachable tire in all inch and millimeter sizes, is scarcely distinguishable in appearance from the average wood wheel as the illustrations will show. It is made with ten and twelve spokes and these are given a slight taper as well as rounding nicely into the hub portion.

The demountable feature is not lost sight of. There are five bolts which run through the hub portion of the wheel from the inner flange which is a part of the hub. Then after the wheel proper is in place, an outer flange is slipped over the ends of the bolts and finally lock nuts secure the whole assembly rigidly. But with this construction alone, the entire drive would be taken by the five through bolts. So in order to take this driving strain from them, a friction plate is interposed between the inside flange and the inner side of the wheel center. This plate has much the same surface as a file and digs into the metal of the wheel, establishing a driving connection and supplementing the work of the bolts.

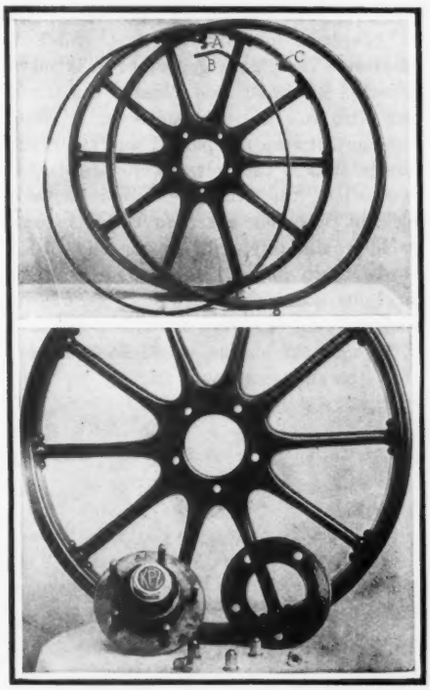
The provision for removing the ring on which the tire is mounted is also ingenious. It is held in place by a split hoop one end of which is bent into hook form, as seen at A. After the tire ring has been slipped onto the rim of the wheel, the hooked end A of the hoop is slipped into a hole in the rim and brought around in its groove to the projection C which is an integral part of the rim. This projection is drilled to take the other end B of band ring or hoop which is threaded. Having slipped this end through the projection C, a nut is screwed on and the hoop can then be easily drawn down tight around the rim. This is a very simple and effective construction, since it is only necessary to engage one or two threads of the hoop end with a nut when all the tightening is easily done by screwing down this nut.

This steel wheel is also made without this detachable feature as well.

A great fault with some demountable and clincher constructions for that matter is that the rim is not watertight. That is, moisture gets in between the rim and the tire beads and serves either to rot the rubber, since there is not much chance for it to dry out, or to rust rim and tire together sometimes so badly that it is a very difficult job to get the latter off. To eliminate this objection, the Crown Prince wheel is fitted with a water-tight packing ring which rests on the bottom of the rim or the bottom of the clincher ring as the case may be, and when all is properly assembled and the holding hoop securely in place there is no chance whatever for moisture to leak in between rim and tire to do damage, it is said.

The Crown Prince is claimed to be about 200 per cent stronger than wooden wheels and at the same time are lighter, present less ridges and grooves to collect dirt and therefore are regarded as better looking when in service. The licensee of this wheel cited a test made some time ago, wherein the steel wheel was shown to withstand a pendulum lateral blow of 10½ tons force while a wood wheel stood up under only 4 tons. This would indicate a great factor of safety.

A Crown Prince 37 by 5 is 25 pounds lighter than a corresponding wood wheel, it is stated, while a 34 by 4 has 15 pounds the advantage of a 34 by 4 wooden type. As compared with the wire wheel, its weight is given as about the same for the same sizes. For instance, a Q. D. 36 by 4½ Crown Prince weighs 45 pounds, while a wire of the same dimensions weighs 40 pounds. The clincher steel wheel of this size tips the scales at 29.5 pounds. These figures were furnished by the Crown Prince representative.



CROWN PRINCE STEEL WHEEL

This wheel is said to weigh less than a wooden wheel of the same size and about the same as a wire wheel of equal dimensions. As may be seen it resembles a wooden wheel greatly. The ring on which the tire is mounted is held in place by a split hoop one end of which is bent into a hook, A. The hook is brought around in its groove to the part C, which is integral with the rim. The other end B of the band ring is threaded and is inserted into the projection C

This lightness coupled with the easily demountable feature, makes it an easy matter to carry one or two spare wheels of the Crown Prince make very conveniently.

Since the Crown Prince wheel has no heavy outer rim, it is said to have no flywheel effect. That is, when starting or stopping, there is no inertia force serving to retard the movement of the vehicle, due to any heavy mass at the outside of the wheels. The cooling feature which the metal spokes affords also is set down among the advantages. These serve to carry away the heat generated in the tires.

The manufacturing of these wheels is a nice proposition. The spokes with their integral center section are pressed out in two halves and these are then welded together. Then the spokes are each four-point spot welded to the outer rim.

The Crown Prince wheels are adaptable to cars now having wood wheels. They can be used by adapting the old style straight hub and inner flange to them, or new Crown Prince hubs can be fitted having a slight taper toward the end so as to make the taking off of the wheels an easy matter. With the demountable feature, this is of course desirable. The prices of these wheels are about the same as wood wheels.

HARTFORD SUES BUFFALO DEALER

Buffalo, N. Y., Jan. 6—Edward V. Hartford, president of the Hartford Suspension Co., of New Jersey, filed Saturday in the United States district court in Buffalo a bill of complaint against Ralph E. Brown, doing business under the name of Ralph E. Brown Motor Car Co., agent for Gabriel Rebound Snubbers. The complainant charges Brown with selling Gabrief Snubbers, which the complainant charges is an infringement on certain patents it holds. The company petitions the court to issue a provisional and perpetual injunction against the Buffalo man. The complaint further alleges that some time ago the complainant brought suit against a Cleveland horn manufacturing company through an agent, for infringing on a patent which had been granted J. M. M. Truffault in 1906. An injunction was issued. The claim now is that the Cleveland company modified that shock absorber and still is an infringer.

Entz Electric Transmission Sensation of New York Show

Device Taken Up by R. M. Owen & Co. Takes Place of Flywheel, Clutch Gearset and Electric Generator-Operated by a Lever

IN these days of electric lighting, electric motor starters and electric gearshifters and electric brakes it is not at all surprising to see in the present Grand Central Palace show the electric transmission which gives promise of being one of the revolutionizing features of car construction. The electric transmission in the form exhibited in an Austrian-Daimler chassis by R. M. Owen & Co., New York city, takes the place of the flywheel clutch, the gearset, the electric starter, and the electric generator. It does not require a large storage battery, as many might expect, but is in reality a unit in itself, and can be used without a battery at all, the only battery fitted being a small 3.5-ampere-hour one, used for starting purposes and to carry the electric lights when the car is idle.

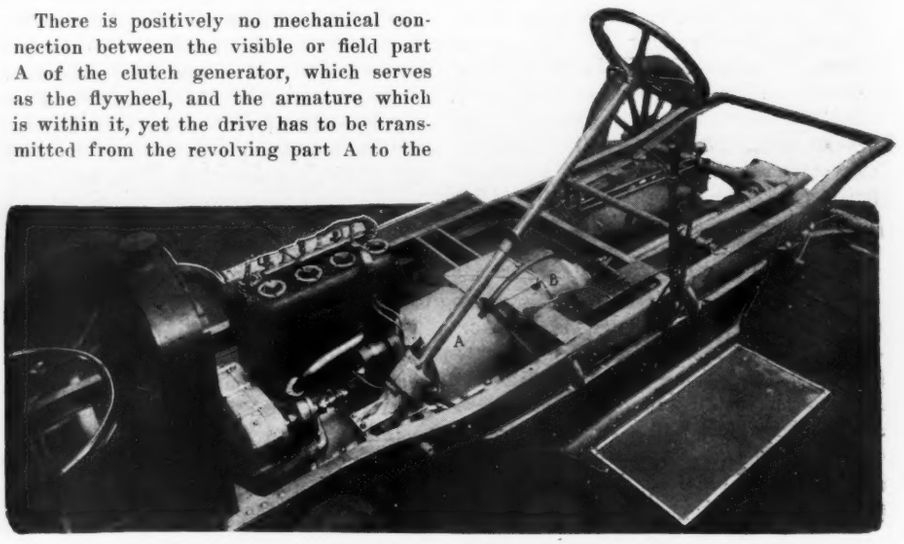
This Entz electric transmission system weighs practically the same as the present gearbox with flywheel, clutch, starter, generator, and the other parts which it displaces, so that in these days of weight reduction it enters the field without a handicap. From a standpoint of price there is no reason why this electrical transmission system will cost more than $25 or $30 more than the equipment it displaces and when it is manufactured on a production bases the same as regular parts of the car there is a possibility that it will be considerably cheaper than the present equipment.

The electric motor, which is part of the installation acts as a brake and reduces the speed of the car gradually when the control which is a handle on the steering wheel, is placed in neutral position. The system also charges the storage battery at a 10-ampere rate only when on direct drive.

Made in Two Units

The Entz electrical transmission system is a two-unit device, as Fig. 1 shows. Part A, which takes the place of the flywheel, is a clutch generator, and part B, an electric motor. From Part B the propeller shaft transmits direct to the rear axle. Part A, while technically known as the clutch generator, is more familiarly known as an electric generator, the outer or visible portion, known as the field part, being rigid with the crankshaft of the motor and forming a flywheel. Part B is the field part of an electric motor. Inside of parts A and B is a revolving armature which in reality is two armatures, one for the electric generator A, and the other for the electric motor B. These armatures are keyed to a common shaft and at its rear and this shaft couples to a universal joint with the propeller shaft.

There is positively no mechanical connection between the visible or field part A of the clutch generator, which serves as the flywheel, and the armature which is within it, yet the drive has to be transmitted from the revolving part A to the armature within it. It is an example of driving through an air space, which of course is not new but used in every electric motor as well as generator.



INSTALLATION OF ENTZ ELECTRIC TRANSMISSION

The manner in which this Entz electrical system works out is as follows: Take its operation on direct drive, which is simplest. The clutch generator A is short-circuited on itself and rotates the armature with it. There is, however, a slight slippage between the part A and the armature in that if the motor were working at 1,000 r.p.m. the armature would be turning the propeller shaft to the rear axle at approximately 960 r.p.m. In other words, there would be a loss of 40 r.p.m. per 1,000 with the car running on a level road. If the car were mounting a heavy hill, where the engine would have to pull more, the slippage would slightly increase.

On all of the other forward speeds, and there are seven others, the change in speed is accomplished by making this slippage between the part A and its armature more, thus on low speed the part A may be revolving 1,000 r.p.m. and the armature within it 250, or perhaps 100 r.p.m. On the other speeds the amount of slippage is according to the requirements.

Controlled by a Lever

The changing of speeds in this electrical system is controlled entirely from a small lever on the steering wheel, which lever is very little larger than that for controlling the spark or throttle. This lever works on the right side of the wheel and had a neutral position and a series of other positions for the different speeds. This lever also is used for starting the engine, it only being necessary to move the lever upwards to the starter position. When changing from one speed to another this lever is moved a little more than an inch and in changing speeds there are no mechanical jumps, as in our sliding gearsets of today, but one speed gradually works into another imperceptibly.

Let us look further at this slippage between the clutch generator and the armature. On the face of it everyone will immediately say that this slippage represents an enormous loss of power between the motor and rear wheels, and consequently the system is a most inefficient one. This would be the case were the slippage not made use of, but this slippage is converted into electric current and this electric current is in turn used to drive the electric motor B, which helps the gasoline engine to propel the car.

Nothing New in the Movement

There is nothing new in this movement in that the clutch generator is practically the same as a generator in an electric power plant in which the armature shaft is rotated rapidly and the outside or field part held stationary. In this case it is all slippage between the armature and the field part, and this generates the electricty which we use to light our homes, drive our street cars, or heat our apartments. In the Entz system the clutch generator has neither the external field part nor the armature stationary, but both revolve at different speeds. The outside or field part always rotates at the crankshaft speed of the gasoline engine, whereas the armature rotates according to the speed controller which determines the speed at which you wish to travel. It will be seen that this generation of electric current by slippage in the clutch

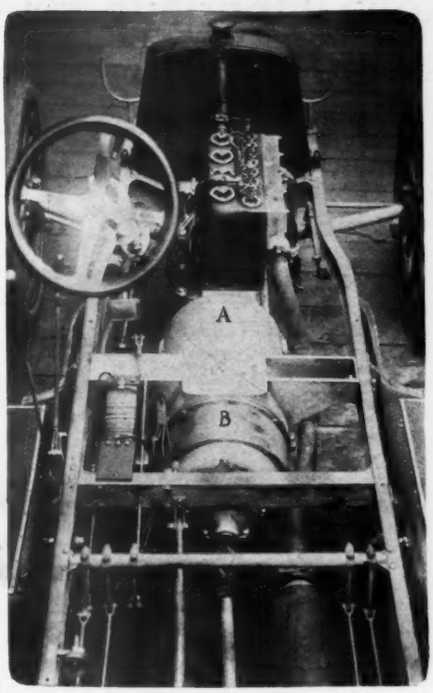
generator is nothing new, and there is no mystery connected with why it generates electricity; in other words, the principle is as old as the electric industry.

Next comes the method in which Entz takes this electric current generated by slippage and uses it to assist the gasoline motor in driving the rear wheels. As previously stated, the part B, Fig. 1, does the work. This is a stationary field of a motor and when the current from the clutch generator A is used in this electric motor, which has an armature on the shaft, that carries the armature for the part A, it, according to the principle of any electric motor, aids in rotating the armature and as the armature is connected with the propeller shaft it lends its force in rotating the propeller shaft in the same way that a man can assist a motor car out of a sandy place, or out of a mud-hole by pushing on one of the driving wheels.

It is through the small controller handle on the steering wheel that this work of assisting by the motor B is accomplished. The electrical system is such that the motor B does not assist on direct drive, at which time it is positively idle, and any slippage occurring in the generator produces an electric current which is used to overcome the internal resistance of the clutch generator itself. As soon, however, as you get into the intermediate speeds the wiring system is so devised that some of the current generated is used on this assisting or boosting electric motor B.

High Pulling Power on Intermediate

On second and third intermediate speeds all of the electric current generated by the slippage is used to drive the boosting motor, thus giving high pulling power on what is ordinarily known as low and second speeds. When you get to third speed the current generated by the slip is utilized by the electric motor, but on weakening the speed of the motor its pulling power is reduced and the slippage of the generator also, thus giving higher speed.



THE TWO UNITS A AND B OF THE ENTZ TRANSMISSION

This utilization of the current is affected by the controller which weakens the field current in the boosting motor and so reduces its assisting power as the speed is increased. When you change into the higher intermediate speeds, there is a correspondingly less use of the boosting power of the motor current, but even here there is not a waste because on these speeds there is less slippage in the clutch generator, and consequently less electric energy generated. The reader should bear in mind that the greater the slippage in such a generator the more electrical energy is produced, and the less the slippage the less the electrical energy.

It is apparent then, from the method in which this electrical transmission works, that the slippage in the clutch generator, which corresponds with the flywheel clutch in our cars of today, is not in reality a loss at all, but rather a flexibility of drive, and which flexibility is made to add to the driving power of the car. If the Entz transmission system were an untried system, this theory might be questioned, but cars of this system have been driven 20,000 miles during the past season, and in not a single instance have they failed. That the slippage spoken of does not result in loss of power is proven by the fact that the gasoline consumption with this system is no higher than with the flywheel clutch and present-day gearset system. If the electric system were not efficient, and if the slippage did result in a loss of power, then the car would not travel as far on a gallon of gasoline as it would on the clutch system, which is disproven by continued testing.

It should be borne in mind that the electric boosting motor B, Fig. 1, performs some subsidiary functions in addition to that of assisting the gasoline engine to do its work. This motor serves as an electric brake and gradually reduces the speed of the car when the controller handle is placed in a neutral position. This motor also charges the storage battery at a 10 ampere-hour rate only when the direct drive is used. Should additional battery charging be needed, there is a still further position of the controller handle, which gives a charging rate of 30 amperes, which is useful after the car has been idle for some time or in emergency cases.

Electric Transmission Not New Idea

This Entz system, although new in its present perfected form on the motor car, is not new, but was conceived as far back as 1898 and actually used in cars as far back as 1903. Since then it has been constantly worked upon and refined until produced in its present form.

R. M. Owen & Co. expect to build a series of cars using this transmission system and also to make manufacturing arrangements with other companies.

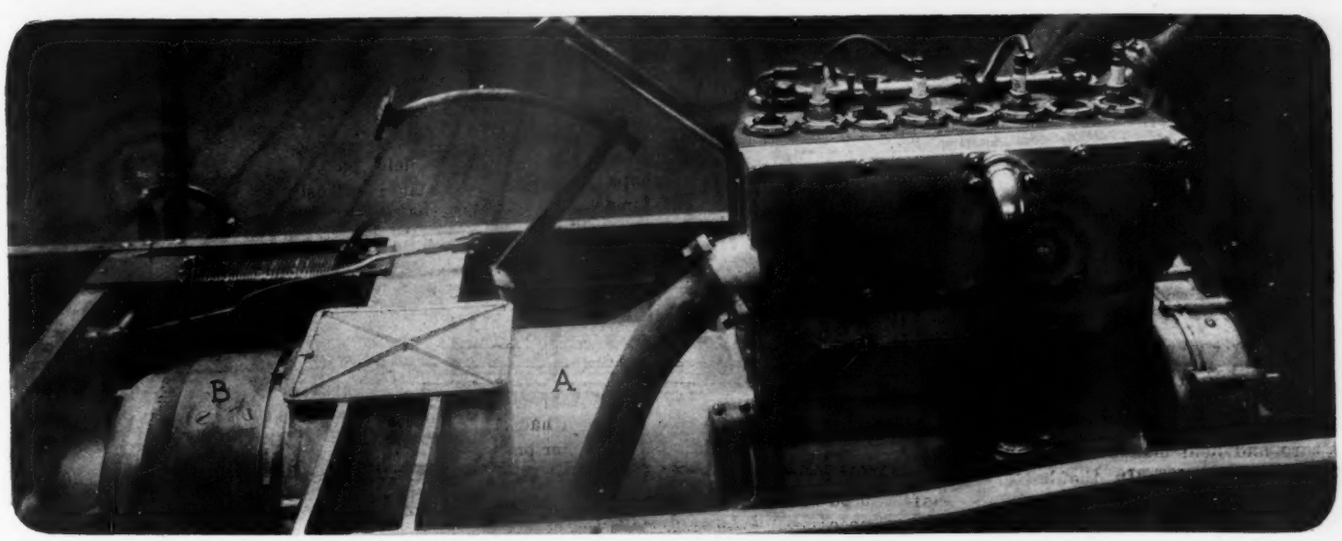
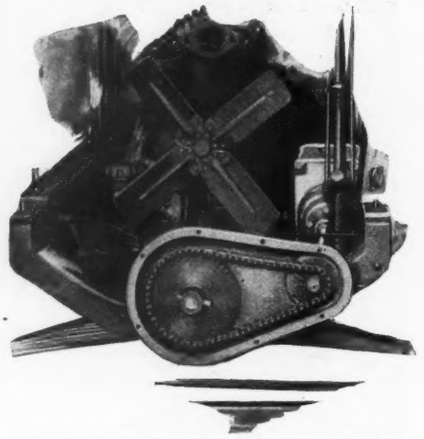


FIG. 1—THE CLUTCH GENERATOR A TAKES THE PLACE OF THE ORDINARY FLYWHEEL AND ACTS AS AN ELECTRIC GENERATOR. THE PART SHOWN AT B IS THE FIELD OF THE MOTOR

Electric Starter Now Important Part of American Car

Majority of Manufacturers Have Adopted Cranking Motor as an Essential Component of the Engine in Their 1914 Products—Details of Various Systems Used

PROBABLY nothing in connection with the motor car will seem more absurd to the motorist of a few years hence than that it was necessary at one stage of its progress for the enthusiastic driver thereof to walk around to the front of the radiator at every start and go through a muscular performance on the crank. It is remarkable that at this late day, when the efficiency, quietness of running, comfort and all the pleasure-giving qualities of the car have been developed to such a degree, the self-starter is only now making its real entry as a part of the finished car. Few cars are being offered without a starter this year. But even now there is still the remnant of a feeling that a starting device is a sort of desirable accessory. However, in the majority of cases it is evident that the car builder has realized more fully than last year the necessity of incorporating the starter as an essential component of his engine, rather than the obviously and often awkwardly applied cranking motor of 1912.



Leece-Neville electric starter installation for Fords

Lighting Influenced Starting

But the starter has made other advances than in the matter of application, and though these developments cannot be confined wholly to one particular form of starter, the overwhelming predominance of the electric starter for the 1914 cars makes this type of vital interest at the present time.

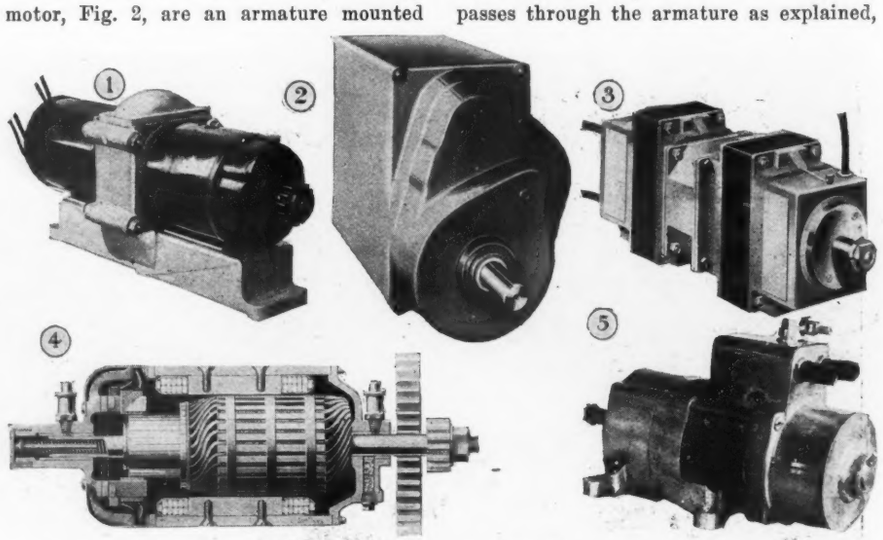
The fact that electric lighting of the car was in full swing is undoubtedly one of the principal reasons for the birth of the electric starter. A storage battery is an essential provision of an electric lighting equipment with an intermittent source of drive such as that of the motor car, and its presence could not fail to suggest that here was already a quantity of stored energy that could be conveniently used for turning the crankshaft on starting. The problem thus presented to the electrical engineer was to produce a small motor, weighing as little as possible, and capable of exerting the torque required to spin an engine from the stationary position. The condition of very small voltage, which had become practically standardized at 6 volts for lighting, is not theoretically suited to the most efficient design of starting motor. For one thing, it necessitates the employment of larger conductors to carry the comparatively heavy current than a motor for a higher voltage requires. This applies as well to the internal windings of armature and field magnet as to the external leads and switch in the battery circuit. In order to obtain the greatest efficiency, some makers have adopted a higher voltage for the starter than the lamp circuit, allowing the same battery to act for both lighting and starting by providing for two ways of connecting up.

Thus, when charging from the generator, the cells of the battery are arranged in sets of three, so that charging can proceed from what is loosely termed a 6-volt generator. But on starting, the cells are connected, by movement of a switch, in series, furnishing a current to the starting motor at 12, 18 or 24 volts, according to the number of cells forming the battery. Another method of achieving the same end, which is always to allow the use of the standard 6-volt lamps, is to use a 12-volt generator, battery and starter, but connect the lamps across a third wire, which has the effect of halving the voltage across the main lines. But in spite of these advocates of the higher voltage, a review of the field shows the 6-volt to be the favorite.

The essentials of the ordinary starting motor, Fig. 2, are an armature mounted on a shaft and a field magnet between the poles of which the armature rotates. The field magnet generally forms the casing of the motor and may be of any shape, and have two or four poles. The poles may be cast integral with the steel casing or bolted in. A coil of heavy copper wire or strip, thoroughly insulated, is placed over each pole. The armature is built up from sheet punchings of the required diameter, containing slots in the periphery which in the assembled armature form recesses which contain the windings. Adjacent to these stamping and mounted rigidly on the same shaft is the commutator, consisting of a number of copper segments insulated from each other and bound together between mica insulating rings. One end of each section of the armature winding is soldered to one of the commutator segments and the other end to another segment at a certain distance radially from the first. The starting end of each section is connected to a commutator segment that forms the leaving end of another section. In this way the current, which is led to the commutator through carbon brushes which bear continuously against the surface, passes first through one section of the winding, back to the commutator, then through the next section, and so on until it leaves by the second brush, which is so positioned, either 90 or 180 degrees from the first, that the current traverses the whole of the armature winding in passing from brush to brush.

Series Winding for Hard Work

If a motor is required to exert a large starting effort, the most suitable winding is series winding. This means that the current enters by one of the brushes, passes through the armature as explained,



1, Ward Leonard motor-generator; 2, Remy Model S L motor-generator; 3, New Esterline direct-connected combination of motor and generator; 4, Interior of Rushmore cranking motor; 5, Jesco motor-generator and switch

then by way of the second brush direct to the field coils, energizing the field magnets and finally passing out to the battery. The carbon brushes are mounted in holders provided with springs which force the brushes continually against the surface of the commutator and thus take care of wear. The brushholder is usually fitted inside the end cover or bearing, and provision is generally made for examining the brush gear or replacing brushes by removing an inspection door. Ball bearings are nearly always used.

Method of Motor Installation

Given the motor, there is still much variety in the method of installing it on the engine. This is a matter that depends largely on the spaces available about the engine, which differ considerably in the various makes of gasoline engines. But all starter applications seem capable of being placed in one of three general classes. These are: 1, by a sliding pinion meshing with teeth on the periphery of the flywheel; 2, by chain or gear to the front end of the crankshaft, and 3, by driving through the timing gear from the pump or magneto shaft. This latter method is really a variation of the second, the timing gear being brought into use to reduce the amount of external gearing necessary. Not included in these classes are the fitting of the motor to the transmission and the utilization of the rotating member of the starter as flywheel. Of this latter there is only one example in extensive use. Its chief merit is that all gearing is dispensed with and there is in consequence no wearing parts except the brushes which are common to all motors.

The table on page ? shows the popularity of the various methods of installing the starter on the cars of 1914. It will be seen that the flywheel method predominates. It is actually used on more than double the number of cars fitted with any other type. The general tendency, Fig. 1, is to incorporate in the end cover of the motor a first reduction gear of 2 or 3 to 1, including an overrunning clutch in one of these gears, and obtaining a further reduction of roughly 8 or 10 to 1 between the sliding pinion and the flywheel. A further detail that is common to most makes is to interconnect the shifter mechanism of the driving pinion with the starting switch, with the aim of rendering meshing easy and silent.

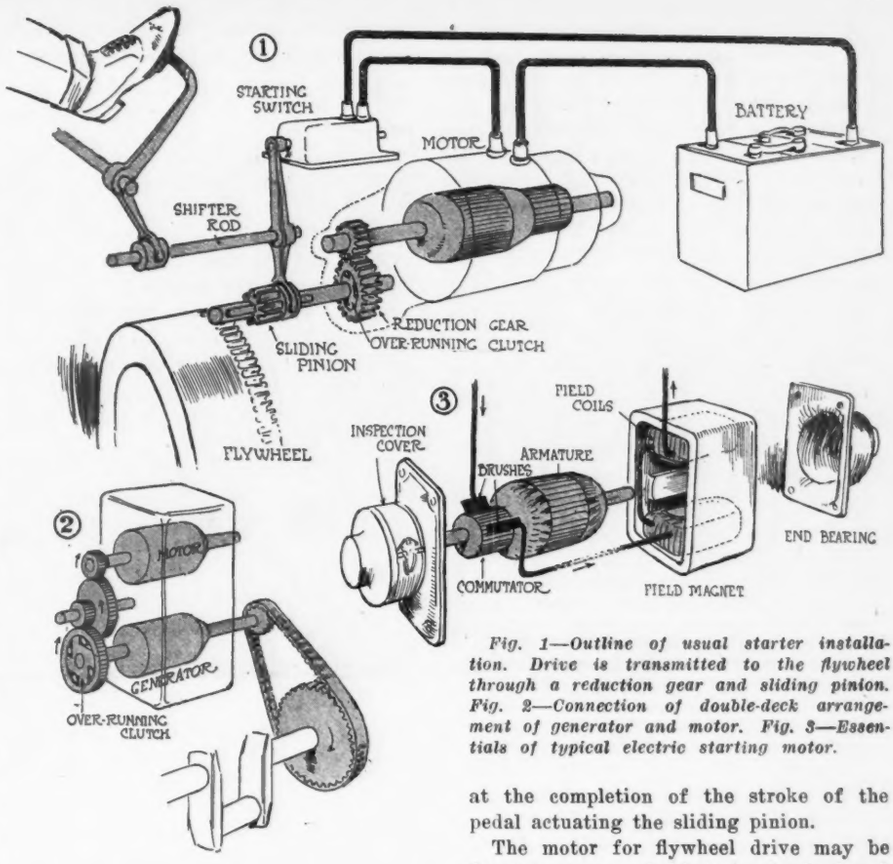


Fig. 1—Outline of usual starter installation. Drive is transmitted to the flywheel through a reduction gear and sliding pinion. Fig. 2—Connection of double-deck arrangement of generator and motor. Fig. 3—Essentials of typical electric starting motor.

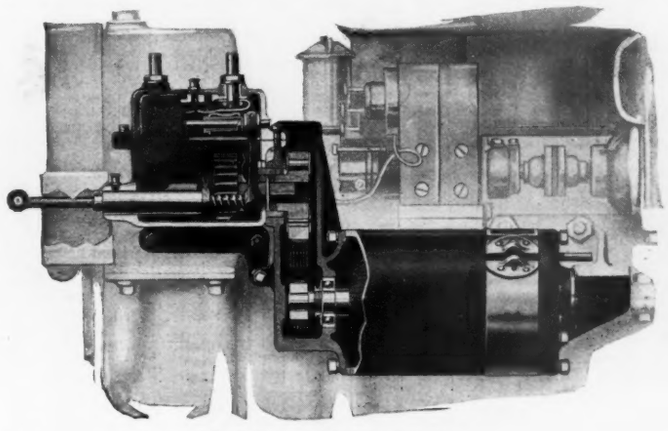
Flywheel Starter Feature

This is one of the details in which the other methods can claim an advantage. In these, the chain or other mechanical connection between the motor and engine is continuously in mesh, the motor coming out of action only through the overrunning clutch, and consequently it is only necessary to switch in the motor without further thought. The starting switch for the flywheel and sliding pinion method generally contains a resistance which is inserted on the first movement of the switch rod so that the motor turns comparatively slow at first till the teeth are in engagement and is finally cut out at the completion of the stroke of the pedal actuating the sliding pinion.

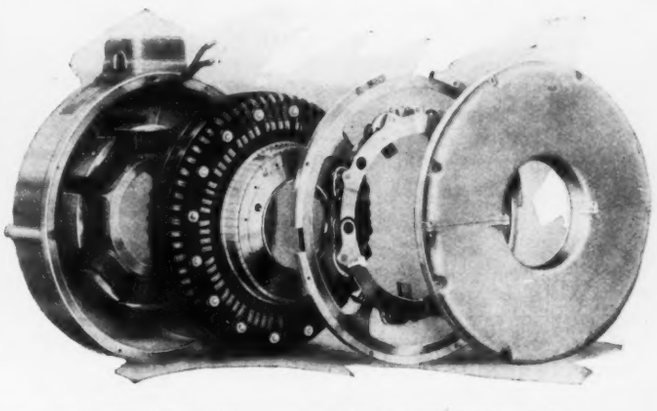
The motor for flywheel drive may be fitted in front or behind the flywheel and above or below the center. Perhaps the commonest position is to mount it on the crankcase ledge immediately in front of the flywheel, where it is accessible and convenient for attachment of the sliding pinion to the pedal on the footboard.

In the double-deck type of electric outfit, Fig. 2, which is meeting with much favor on account of its claims to compactness, the drive from the starting motor is usually taken through the armature of the generator half of the combination. Thus, assuming the car to be standing, and the motor switch thrown in, the motor armature at once sets the train of reduction gear between the two armatures in motion in the direction shown. The second large gear is not fixed permanently to the generator shaft, but operates through an overrunning clutch.

This latter is a device that permits



Auto-Lite cranking installation



Essentials of the U. S. L. flywheel-motor-gen erator

drive in only one direction and consists of an inner steel member containing recesses in which are placed hardened steel rollers. The gear rides easily in one direction on this inner member and the recesses are so proportioned that when the rollers occupy the wide end of the recesses this motion is not affected. But on attempting to turn the outer gear in the opposite direction, the rollers pass along the recess until they are locked against the two members, making the whole virtually a solid drive.

This is what happens when the starting motor is operating and the power is thus transmitted to the pinion on the opposite end of the generator armature shaft and from there to the crankshaft by chain. Immediately the engine commences to fire there will be a tendency to spin the motor at the enormous speed represented by the whole of the reduction gear, but the roller clutch at once comes out of action and prevents this. The generator armature then continues to spin with the engine at a speed of two or three to one times that of the crankshaft, depending on the ratio of the chain drive, and the motor comes to rest on releasing the starting switch.

An overrunning clutch is necessary in almost all starting equipments to protect the motor. In cases where the drive is by chain to the crankshaft, the clutch is usually incorporated in the chain wheel; in flywheel attachments it is fitted in the second gear of the reduction.

A review of the starter field follows:

Auto-Lite—The Electric Auto-Lite Co., Toledo, O., manufactures motors for front end or flywheel drive. The latter is a cylindrical model, 6¼ inches in diameter, with two flat sides. A reduction gear consisting of a pinion on the armature shaft and an internally toothed gear is inclosed in a housing fitted to the end cover. This first step provides for a reduction of about 2 to 1. The outer drive pinion, which is arranged for sliding into mesh with the flywheel, makes a further reduction of about 9 to 1, so that the total ratio between motor and crankshaft is about 18 to 1.

The starting switch is mounted adjacent to the shifter rod which operates the sliding pinion and is connected thereto so that the motor starts at the moment of meshing with the flywheel. An overrunning clutch is fitted in the reduction gear. The terminals are carried through the casing at the end, leaving the sides clear for whatever method of attachment is suitable. A metal band surrounds the casing at the commutator end over inspection doors. This is easily removable when it is desired to examine the brush gear. The field winding is series, two of the four poles carrying coils.

The front end starter of the same concern can be fitted to an old car with little alteration. The drive is by chain to the forward end of the crankshaft through an overrunning clutch. A cast-iron bracket integral with the casing is the means of attaching to the engine, and the motor can be removed almost as readily as a magneto.

Aplco—In the Aplco electric system, made by the Apple Electric Co., Dayton, O., the two functions of generating current for the lights and charging of the battery and the motive power for starting the engine are combined in a single machine. In conjunction with this a controller is fitted in front of the seat, the purpose of which is to make the necessary alteration in the connection from the 24-volt battery when using the equipment as a starter or generator.

For this purpose the cells of the storage battery are divided into groups and these can be arranged in series or multiple, by certain positions of the controller lever. In starting, the cells are arranged to supply a 24-volt current, but when the engine is running the charging proceeds at a 6-volt rate.

The machine has a cylindrical casing and is designed for installation at the side of the motor, driving by gear or chain to the front end of the crankshaft.

Bijur—Two types of starters are made by the Bijur Motor Lighting Co., Hoboken, N. J., both alike so far as the general electric characteristics are concerned, but which differ only in the shape of the magnet casing. One is a four-pole rectangular model, and the other a cylindrical machine. Both are adapted for application to the flywheel of the engine, but the necessary gearing and method of mounting is left to the car builder, the only stipulation being that whatever means is used for the operation of the sliding pinion which meshes with the flywheel, the starting switch be connected so as to operate simultaneously. The switch consists of a sliding member carrying a resistance at one end. In action, two contact pieces to which this resistance is attached first pass on to two brushes which form the main terminals of the switch and in so doing insert the resistance in the circuit. Further movement of the sliding member brings a laminated brush directly in contact with the two terminals, thereby short-circuiting the resistance and allowing the full current to flow to the motor.

In the cylindrical model, the four poles are bolted into the steel casing and all carry field coils. In the rectangular model, although it is of the four-pole type also, only two of these, the upper and lower, are wound. This is on account of space considerations. It is desirable for adaptability to have a starting motor as narrow as possible to fit the sometimes confined spaces available about the motor. By eliminating the side coils a field casing much narrower than usual is obtained.

One of the noticeable features of the cylindrical model is its clean external design. The end covers are simply flat disks and the field casing extends at the same diameter over the commutator. Holes are

Data on Electric Cranking Equipment of 1914 Cars

CAR AND MODEL	Starter	Stock or Extra	Voltage	Speed R.P.M.	Weight Lbs.	Ratio	Drive	Battery
Abbott-Detroit, 34-40	Auto-Lite	Stock	6	80	55	40:1	Gear to Shaft	Willard-120
Abbott-Detroit, 44-50	Auto-Lite	Stock	6	80	55	40:1	Gear to Shaft	Willard-120
Abbott-Detroit, 50-60	Auto-Lite	Stock	6	140	48	28:1	Flywheel	Willard-120
Allen, 38	Auto-Lite	Stock	6	120	.....	13:1	Flywheel	Willard-100
Allen, 40	Auto-Lite	Stock	6	120	.....	13:1	Flywheel	Willard-100
American (all models)	Disco	Stock	12	150	95	20:1	Timing Gear	Willard- 50
Apperson	Bijur	Stock	6	.....	.....	.....	Chain	Willard-100
Buick, 24 and 25	Delco	Stock	6	130	.....	18:1	Flywheel	Exide- 90
Buick, 36 and 37	Delco	Stock	6	130	.....	20:1	Flywheel	Exide- 90
Buick, 55	Delco	Stock	6	130	.....	20:1	Flywheel	Exide- 90
Cadillac	Delco	Stock	6	90	83	25:1	Flywheel	Exide-130
Cartercar, 7	Delco	Stock	6	114	48	24:1	Flywheel	Exide-100
Cartercar, 5	Jesco	Stock	8	72	72	24:1	Chain	Willard- 80
Case, 25	Westinghouse	Stock	6	110	.....	25:1	Flywheel	Willard- 80
Case, 35	Westinghouse	Stock	6	100	.....	25:1	Chain	Willard-100
Case, 40	Westinghouse	Stock	6	85	.....	.....	Chain	Willard-120
Chalmers, 24	Entz-Chalmers	Stock	18	100	112	26:1	Chain	U. S. L.-50
Cole, 14-4	Delco	Stock	6	80	120	25:1	Flywheel	Exide-80
Cole, 14-6	Delco	Stock	6	80	120	25:1	Flywheel	Exide-80
Chandler	Westinghouse	Stock	6	90	.....	15:1	Flywheel	Willard- 80
Chevrolet	Auto-Lite	Stock	6	150	62	17:1	Flywheel	Willard-100
Chevrolet	Gray and Davis	Stock	6	110	52	24:1	Flywheel	Willard-100
Correja, 4	Ward Leonard	Extra	6	90	.....	30:1	Flywheel	Willard-100
Correja, 6	Ward Leonard	Extra	6	100	.....	20:1	Chain	Willard-100
Cunningham	North East	Stock	16	35	63	33:1	Chain	Willard- 50
Dorris	Westinghouse	Stock	6	145	50	24:1	Flywheel	Willard- 80
Edwards, 25	U. S. L.	Stock	24	150	60	1:1	Direct	U. S. L.-100
Fiat 54, 55 and 56	Westinghouse	Extra	6	70	55	24:1	Flywheel	Willard-120
Franklin, 6-30	Entz	Stock	18	150	.....	44-17	Chain	Willard- 35
Havers, 6-44	North East	Stock	16	25	.....	28:1	Chain	Willard- 50
Havers, 6-60	Gray and Davis	Stock	6	90	.....	28:1	Chain	Willard- 80
Haynes, 26, 27 and 28	Leece-Neville	Stock	12	100	52	20:1	Flywheel	Willard- 60
Henderson (all models)	Ward Leonard	Stock	6	90	48	25:1	Flywheel	Willard-100
Herreshoff, 4-30	Westinghouse	Stock	6	120	25	18:1	Flywheel	Willard-100
Herreshoff, 6-30	Westinghouse	Stock	6	80	25	18:1	Flywheel	Willard-100
Hupmobile, 32	Westinghouse	Extra	6	150	40	18:1	Flywheel	Willard-100
Hudson	Delco	.....	.....	90	.....	.....	Flywheel	.....
Jeffery, 83 and 96-6	U. S. L.	Stock	24	250	.....	1:1	Direct	U. S. L.-100
Jeffery, 93-4	U. S. L.	Stock	12	250	.....	1:1	Direct	U. S. L.- 80
Jackson	Auto-Lite	.....	6	.....	.....	.....	.....	Willard-120
King, B	Ward Leonard	Extra	6	100	37	30:1	Flywheel	Willard- 80
Kissel, 40	Kissel	Stock	6	100	74	16:1	Flywheel	Willard-120
Kissel, 48-6 and 60-6	Kissel	Stock	6	100	74	16:1	Flywheel	Exide-120
Kline	Rushmore	.....	6	.....	.....	.....	Flywheel	.....
Knox, 46 and 66	Esterline	Stock	6	100	95	38:1	Flywheel	Willard-120
Knox, 44	Esterline	Stock	6	80	95	38:1	Flywheel	Willard-120

cut at this end to form inspection doors which are covered by a metal band provided with a snap clasp. The terminals are brought out through the end cover instead of at the side, and this also contributes to the smoothness of the exterior. Feet are not fitted as standard to the motor, the idea being to allow any suitable method of mounting according to the peculiarities of the engine. A common method is the provision of a cradle conforming to the curvature of the magnet and a steel binding strap. With reference to the gear reduction ratio, this is generally arranged 17 to 1 and 20 to 1 between the motor and engine. In the flywheel drive the first step of reduction should be about 2 to 1. Ball bearings are used for the armature shaft.

Deaco—The Detroit Electric Appliance Co., Detroit, Mich., is in line with other makers in producing both separate motors and double-deck units. In all models the casings are cylindrical and four-polar. The smallest model, which is designed for application to the flywheel on the sliding-pinion principle, contains a reduction gear which is mounted in a housing on the end cover. This gear provides a reduction of about 2 to 1 through the use of a pinion on the end of the armature shaft meshing with teeth internally cut in the outer member of an overrunning roller clutch. This motor measures 5½ inches in diameter by 7¼ inches long, and weighs 29 pounds. It is intended for gearing with the flywheel at a ratio of about 9 to 1, so that the complete reduction ratio between motor and engine is in the neighborhood of 18 to 1.

The operation of the starter is by a small pedal on the footboard in connection with a shifter rod extending from the sliding-pinion housing. Simultaneously with this movement, current is applied to the motor through the closing of a starting switch which first inserts a resistance in the circuit and finally connects direct.

The double-deck outfit consists of a generator and starting motor coupled by an end casing containing a double reduction gear. The motor itself is identical with the separate machine. This set also includes the usual overrunning clutch which is mounted on the generator shaft so that the motor and reduction gear remain inactive except when starting. Four carbon brushes are used in the motor, the brush holders being die-cast and attached to a fiber brush holder disk mounted in the end cover. The winding of the field is series and flat copper wire is used for the coils.

Disco—The Disco Co., Detroit, Mich., in its double-deck outfit, instead of coupling the separate units, uses a single casting for the motor and generator fields, but this is only to obtain a strong and compact construction. The magnetic circuits of both units are distinct, a wall in the casting separating them.

Both motor and generator fields are two-polar, the poles being square and integral with the casting. A double reduction, including an overrunning clutch, is inclosed in a combined end cover and in one method of application to the engine, the equipment is located over the magneto shaft, to which it is connected by chain.

The magnet casing is rectangular, but separate cylindrical extensions for the commutator end bearing are provided, so that inspection of the brush gear can be made easily. Electrically, the construction follows standard electric practice. The armature laminations are stamped with lips to the slots and after winding wood battens are forced in to hold the winding in place. By this method no binding wires are necessary. Flat copper is used for the steel coil and there are four carbon brushes. In tests the starting motors have shown an efficiency of nearly 70 per cent. The Disco company also makes separate motors and generators.

Delco—The operation of starting on the Delco electric equipment, made by the Dayton Engineering Laboratories Co., Dayton, O., is performed by the same machine as is used for generating the lighting and charging current. It is not a coupled arrangement of motor and generator, but the same armature and field magnet are used for both purposes.

In order that the machine may perform this dual function, the field and armature carry two windings, one set of which is active at a time. The Delco equipment is made to suit various applications. In one, the dual machine is attached at the side of the engine and drives through an extension of the camshaft gear housing. When operating as a motor, a sliding pinion meshes with teeth on the flywheel and so starts the engine. An overrunning clutch is incorporated in the gear mechanism to permit the engine to speed up after starting without spinning the armature at a dangerous rate.

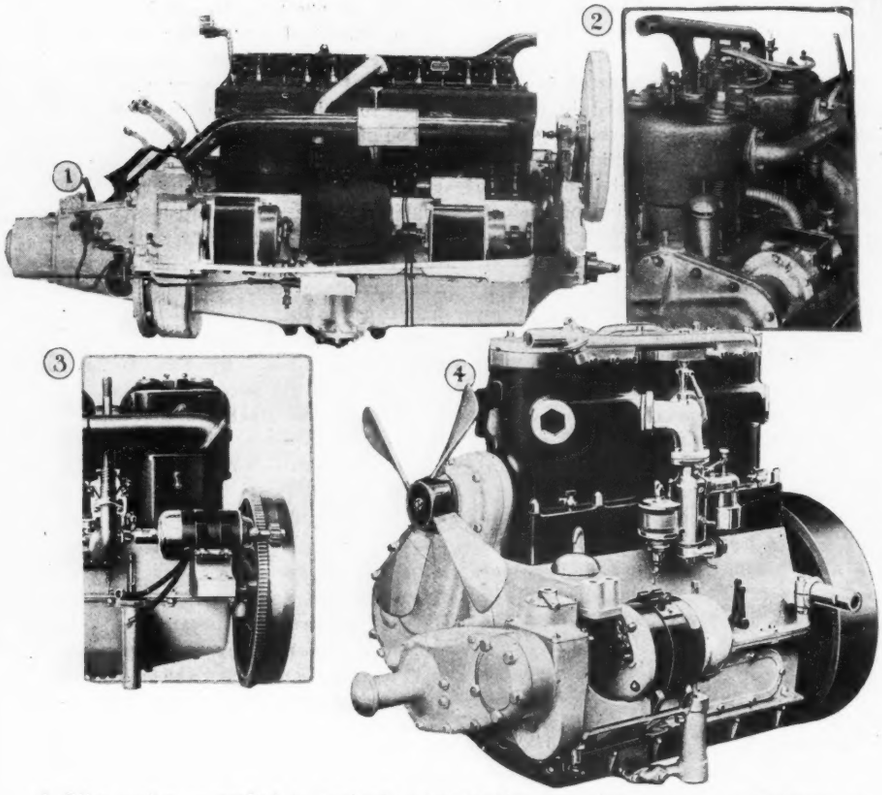
The magnet casing is rectangular and the two poles are bolted in. The armature is provided with two commutators, the larger carrying the motor current and the smaller dealing with the generator current. A housing at one end of the machine contains a reduction gear and the turning effort is transmitted to the flywheel by movement of a shifter rod which slides the meshing pinion and at the same time closes the starting switch. This switch is of the two-way type and when not in use for starting it connects the generator leads to the battery for charging.

The means of operation of the starter may be either lever or pedal. In one equipment a magnetic latch is used which connects the pinion sliding mechanism to the clutch pedal so that no special lever or pedal is required. A small push button conveniently situated operates the magnetic latch.

Entz—The Entz, made by the Dyneto Electric Co., Syracuse, N. Y., is an 18-volt combination motor and generator which

Data on Electric Cranking Equipment of 1914 Cars

CAR AND MODEL	Starter	Stock or Extra	Voltage	Speed R.P.M.	Weight Lbs.	Ratio	Driv	Battery
Knox, M-3	Esterline	Stock	6	90	75	11:1	Flywheel	Willard-120
Keeton, E	Jesco	Stock	6	125	53	.....	Chain	Willard-100
Krit	Disco	Extra	6	138	.....	16:1	Gear	Willard- 80
Locomobile (all models)	Gray and Davis	Stock	6	80	78	20:1	Flywheel	Willard-120
Lozier, 77	Gray and Davis	Stock	6	100	.....	15:1	Flywheel	Willard-100
Lozier, 84	Gray and Davis	Stock	6	100	.....	30:1	Chain	Willard- 80
Lyons	North East	Stock	24	80	73	14:1	Chain	Willard- 35
Marathon "Champion"	Apple	Stock	6	75	.....	1:1	Chain	Willard-100
Marathon "Winner"	Jesco	Stock	6	100	.....	2:1	Chain	Willard-100
Marion, G	Westinghouse	Stock	6	100	95	18:1	Chain	Willard-120
Marion, B	Westinghouse	Stock	6	100	95	15:1	Flywheel	Willard-120
Marmon	North East	Stock	.....	.....	.....	40:1	Chain	
Metz	North East	Extra	.....	.....	.....	.....	.....	
Moline	Wagner	Stock	12	120	.....	.....	Flywheel	Willard- 80
Monarch	Deaco	Stock	6	125	150	8:1	Flywheel	
Moon, 6-50	Delco	Stock	6	100	.....	22:1	Flywheel	Exide-120
Moon, 42	Delco	Stock	6	120	.....	27:1	Flywheel	Exide-120
Mason, L	Jesco	Extra	6	80	70	3:1	Chain	Willard-120
Maxwell, 35	Deaco	Extra	6	125	.....	18:1	Flywheel	Willard-100
Maxwell, 50-6	Gray and Davis	Stock	6	95	58	17:1	Flywheel	Willard-100
Mercer	Rushmore	Stock	.....	.....	.....	.....	.....	
Mitchell	Remy	Stock	6	75	80	25:1	Gear	Gould
Norwalk, C and D	Westinghouse	Stock	6	75	62	28:1	Flywheel	Willard-100
National	Gray and Davis	Stock	6	.....	.....	.....	Flywheel	
Oldsmobile, 54	Delco	Stock	6	100	.....	25:1	Flywheel	Exide-120
Oakland, 36	Delco	Stock	6	105	55	20:1	Flywheel	Exide-120
Oakland, 43	Delco	Stock	6	90	70	20:1	Flywheel	Exide-120
Oakland, 48 and 62	Delco	Stock	6	90	70	20:1	Flywheel	Exide-150
Overland, 79	Gray and Davis	Extra	6	.....	.....	28:1	Chain	Willard- 80
Paige-Detroit, 36	Gray and Davis	Stock	6	105	.....	15:1	Flywheel	Willard- 90
Pathfinder, 4-40	Gray and Davis	Extra	6	100	90	15:1	Flywheel	Willard-120
Pathfinder, 6-68	Gray and Davis	Stock	6	100	102	15:1	Chain	Willard-120
Packard, 2-38	Bijur	Stock	6	100	.....	20:1	Flywheel	Willard-120
Pierce-Arrow	Westinghouse	Stock	6	.....	.....	.....	.....	Exide—
Peerless, 6-38, 48	Gray and Davis	Stock	6	90	86	22:1	Flywheel	Willard-120
Peerless, 6-60	Gray and Davis	Stock	6	60	86	22:1	Flywheel	Willard-120
Palmer-Singer, K	Westinghouse	Stock	6	80	.....	30:1	Flywheel	Willard-100
Regal (all models)	Rushmore	Stock	6	110	60	8:1	Flywheel	Willard-100
Reo, 5	Remy	Stock	6	125	62	15:1	Worm Gear	Willard-100
Republic, E	Delco	Stock	6	.....	150	31:1	Flywheel	Exide-120
Simplex (all models)	Rushmore	Stock	6	100	30	12:1	Flywheel	Willard-120
Speedwell, H	Wagner	Stock	12	70	88	15:1	Chain	Willard-100
Stearns-Knight, 4	Gray and Davis	Stock	6	60	55	25:1	Flywheel	Willard- 80
Stearns-Knight, 6	Gray and Davis	Stock	6	50	65	27:1	Flywheel	Willard-120
Studebaker (all models)	Wagner	Stock	6	.....	.....	20:1	Chain	Willard
Stuts, E	Remy	Stock	6	90	62	16:1	Flywheel	Willard-120



1, Bijur system as applied to Packard; 2, Westinghouse cranker in Case; 3, Rushmore on Simplex; 4, North East system installed on Lyons-Knight

may be mounted on a bracket at the left front end of the engine or in any other convenient place, and is permanently connected to the crankshaft by a silent chain. The outside dimensions of the motor-generator are 13.5 inches by 9.75 by 7 inches and the weight 100 pounds. It is geared to run at two and one-half to three times the speed of the crankshaft. The electrical connection between the battery and the motor-generator is made by means of a knife-edge switch, located on the dash. Closing the switch causes the current to pass from the battery to the motor-generator, if the latter is stationary, thus starting the engine. As soon as the engine reaches a speed when the generator current is of the correct voltage, charging of the battery commences.

Esterline—In the design of the new direct-connected system of the Esterline Co., Indianapolis, Ind., it has been the endeavor of the makers to retain all the advantages of the separate unit system, and at the same time eliminate its disadvantages. The unit consists of a motor and a generator, both of the same size and dimensions, their shafts end to end, with the motor gear reduction and the free running clutch between the two machines. The clutch and gears are fully inclosed and run in oil. The generator shaft is extended and arranged for connection to the engine crankshaft, by silent chain drive or through the timing gears.

When the engine is running, only the generator armature revolves, the motor and gears being at rest. When current is applied to the motor the clutch, one part of which is keyed to the generator shaft, engages and the motor starts the engine through the same drive which operates the generator. The generator and motor are of unique construction, being four-pole machines with field magnets of laminated

Cars Using Starters—Make and Type

Abbott-Detroit	Autolite	Elect.
Allen	Autolite	Elect.
American	Disco	Elect.
Ames	Gray & Davis	Elect.
Apperson	Undecided	Elect.
Arbenz		Elect.
Auburn	Remy	Elect.
Austin 55	Remy	Elect.
Austin 77	Own	Air
Buick	Delco	Elect.
Cadillac	Delco	Elect.
Cameron	Diehl	Elect.
Cartercar 7	Delco	Elect.
Cartercar 5	Jesco	Elect.
Case	Westinghouse	Elect.
Chalmers	Chalmers-Entz	Elect.
Chandler	Westinghouse	Elect.
Chevrolet *	Autoline	Elect.
Colby	Gray & Davis	Elect.
Cole	Delco	Elect.
Continental 30	Optional	Elect.
Continental 27	Jesco	Elect.
Corbitt	North East	Elect.
Correja	Ward-Leonard	Elect.
Crane	Rushmore	Elect.
Crow-Elkhart D-42, D-45	Prest-O	Acet.
Crow-Elkhart other models	Emerson	Elect.
Cunningham	North East	Elect.
Davis 35 J & R	Westinghouse	Elect.
Davis 50-A and 6-50	Gray & Davis	Elect.
Detroiter *	Remy	Elect.
DeSoto Six	Own	Air
Dispatch *	U. S. L.	Elect.
Dorris	Westinghouse	Elect.
Duryea	Own	Mech.
Enger *	North East	Elect.
Falcar	Thurber	Air
Flat *	Westinghouse	Elect.
Flyer	Ward-Leonard	Elect.
Franklin	Entz	Elect.
Glide	Westinghouse	Elect.
Grant *		Elect.
Great Southern *	Optional	Opt.
Great Western	Gray & Davis	Elect.
Great Eagle	Autolite	Elect.
Havers	Gray & Davis	Elect.
Haynes	Leece-Neville	Elect.
Henderson	Ward-Leonard	Elect.
Herreshoff	Westinghouse	Elect.
Holly *	Optional	Opt.
Howard	Jesco	Elect.
Hudson	Delco	Elect.
Hupmobile *	Westinghouse	Elect.
Illinois	Kellogg	Air
Imperial	North East	Elect.
Inter-State	Apico	Elect.
Jackson	Autolite	Elect.
Jeffery	U. S. L.	Elect.
Keeton	Jesco	Elect.
King	Ward-Leonard	Elect.
Kisselkar	Esterline	Elect.
Klinekar	Rushmore	Elect.
Knox	Esterline	Elect.
Krit *	Disco	Elect.
Lambert 46	Briggs ..	Elect.
Lambert 60	Disco	Elect.
Lenox	Gray & Davis	Elect.
Locomobile	Gray & Davis	Elect.
Lozier	Gray & Davis	Elect.
Luverne	Kellogg	Air
Lyons-Knight	North East	Elect.
Marathon Runner*	Jesco	Elect.
Marathon Winner	Jesco	Elect.
Marathon Champion	Apico	Elect.
Marion	Westinghouse	Elect.
Marmon	North East	Elect.
Maxwell 35-4	Deaco	Elect.
Maxwell 50-6	Gray & Davis	Elect.
McFarlan	Own	Air
Mercer 35-M	Rushmore	Elect.
Mercer 35 H & O	Rushmore	Elect.
Meteor M-36 *	Jesco	Elect.
Meteor F-40 *	Jesco	Elect.
Meteor W-6-45	Jesco	Elect.
Metropole *	Ever-Ready	Mech.
Metz *	North East	Elect.
Mitchell	Remy	Elect.
Moline Knight	Wagner	Elect.
Monarch *	Deaco	Elect.
Mondex-Magic	Westinghouse	Elect.
Moon	Delco	Elect.
Morse	Gray & Davis	Elect.
Moyer	U. S. L.	Elect.
National 40	Gray & Davis	Elect.
National Six	Deaco	Elect.
Norwalk	Westinghouse	Elect.
Oakland	Delco	Elect.
Ohio	Jesco	Elect.
Oldsmobile	Delco	Elect.
Overland *	Gray & Davis	Elect.
Packard	Bijur	Elect.
Paige 25	Disco	Elect.
Paige 36	Gray & Davis	Elect.
Palmer-Singer	Westinghouse	Elect.
Partin-Palmer *	Autolite	Elect.
Paterson	Autolite	Elect.
Pathfinder	Gray & Davis	Elect.
Peerless	Gray & Davis	Elect.
Pierce - Arrow 38 C-2	Westinghouse	Elect.
Pilot	Gray & Davis	Elect.
Pratt	Gray & Davis	Elect.
Premier	Remy	Elect.
Pullman	Westinghouse	Elect.
Rayfield	Undecided	Elect.
Read *	Optional	Opt.
Regal	Rushmore	Elect.
Reo	Remy	Elect.
Republic	Delco	Elect.
Richmond	Jesco	Elect.
Selden	Rushmore	Elect.
S. G. V.	U. S. L.	Elect.
S & M	Rushmore	Elect.
Simplex	Rushmore	Elect.
Spaulding	Entz	Elect.
Speedwell	Wagner	Elect.
Spoerer	Gray & Davis	Elect.
Staver	Esterline	Elect.
Stearns-Knight	Gray & Davis	Elect.
Studebaker	Wagner	Elect.
Stutz	Remy	Elect.
Touraine	Gray & Davis	Elect.
Tribune	Undecided	
Vaughan	Bijur	Elect.
Velie	Gray & Davis	Elect.
Vulcan *	Gray & Davis	Elect.
Willys-Knight	U. S. L.	Elect.
White	White-Entz	Elect.
Winton	Own	Air
Zimmerman B-6	Optional	Opt.

*Extra charge for starter.

steel with no joints in the magnetic circuit. The width is 4¼ inches, height 7⅛ inches. Each machine weighs 25 pounds; the weight of the entire outfit, with gears and clutch is 60 pounds.

Regulation of the generator is inherent, there being no moving part but the armature, a feature which has characterized Esterline apparatus from the beginning. Since there are no gears to engage, no starting resistance required, the starting switch is actuated by a solenoid, much the same as is used for the electric gearshift, controlled by a simple push button. When desired, a pedal-operated switch is furnished. The normal speed of the generator is one and a half times or double engine speed.

Both the motor and the generator operate at 6 volts, requiring a simple three-cell storage battery. The motor and generator can be furnished to operate separately if desired, and the motor can be supplied with or without the clutch and gear reduction when furnished separately.

Gray & Davis—The starting motors of Gray & Davis, Boston, Mass., are made in three sizes, a low-speed model and medium and high-speed models. All are cylindrical in shape and are supplied with or without reduction gear. An unusual feature of some of the models is that the reduction gear is of the planetary type which is used for its compactness. The reduction is single; that is, only two toothed members are in mesh.

The inner one is carried on an eccentric keyed to the armature shaft and its teeth engage continuously at a varying point with the internally toothed second member. The whole gear easily is contained in an end cover the same diameter as the magnet casing. The magnet casing is steel and the poles are built up from laminations. The winding in all models is straight series and carbon composition brushes are used.

In fitting the motor for flywheel drive a two-point switch is interconnected with the shifting mechanism of the sliding pinion. In its first position the motor circuit is closed through a resistance contained in the switch casing, allowing meshing to take place quietly. The second position cuts out the starting resistance and the full torque of the motor is applied.

Three sizes of motors are made to suit reduction ratios with the engine of 15 to 1, 26 to 1, and 36 to 1. The high-speed model weighs 31 pounds, and the low-speed model 45 pounds without the reduction gear. All are for operation on a 6-volt circuit.

A typical installation is the mounting of the motor on the crankcase ledge immediately in front of the flywheel with the generator at the opposite end of the engine obtaining its drive from the front end. But in case where these spaces are not available a duplex design in which the motor is mounted over the generator is provided. In this combination the two units are connected by inclosed chain.

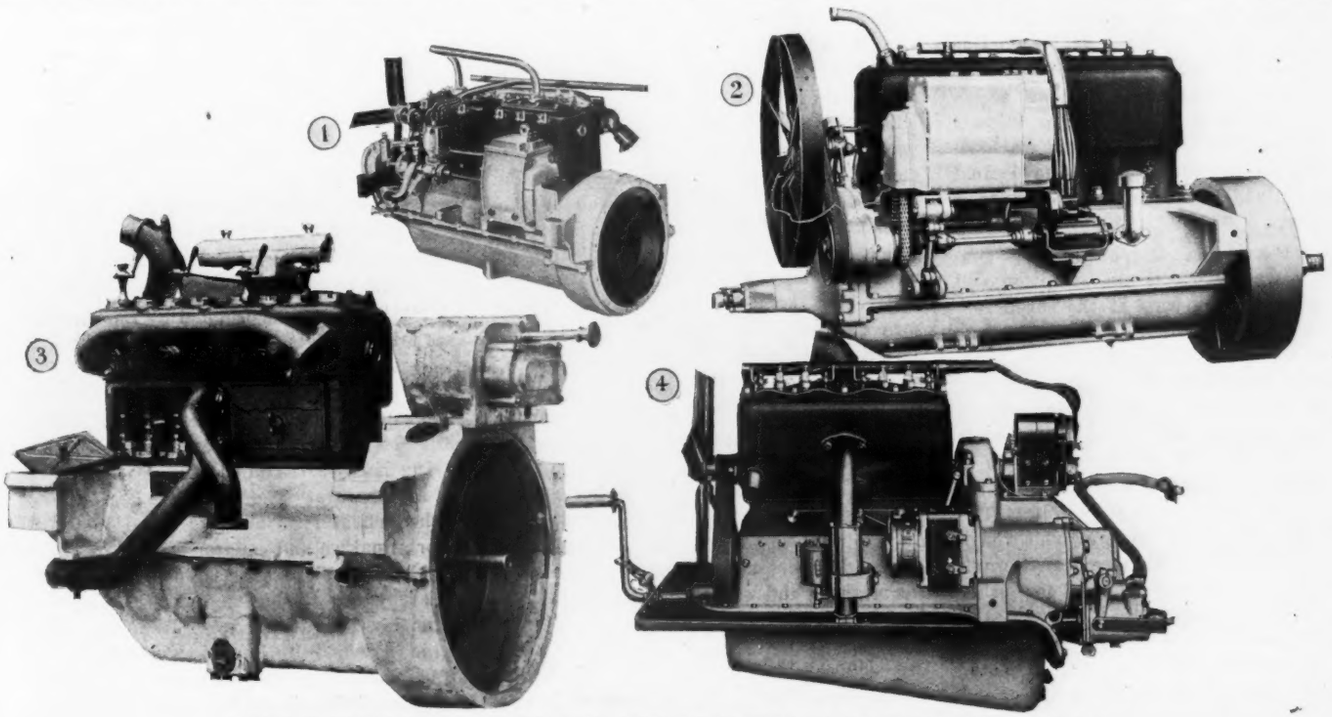
Hartford—In the Hartford starting system made by the Hartford Suspension Co., Hartford, Conn., which is designed for drive by chain to the crankshaft, use is made of a flywheel on the armature shaft. A friction clutch is provided between the motor and the train of gears and in operation the motor is first speeded up and then the clutch is put into action so that the energy of the rapidly spinning flywheel is made to contribute to the starting torque necessary to overcome the standing engine.

The motor itself is a cylindrical model with two poles with wide faces bolted into the casing. This is mounted on a base which has an extension consisting of a gearcase containing a worm-gear reduction. The flywheel occupies a position between the motor and the reduction gear and the clutch is arranged inside the flywheel. Operation of the clutch is by a rod passing through the hollow worm shaft. This rod is operated by means of a lever projecting from a starting switch fitted on top of the gearcase, the switch making contact simultaneously with the closing of the clutch faces. The drive from the worm-wheel shaft is by chain to the crankshaft, an overrunning clutch being fitted in the chain wheel on the crankshaft to prevent back drive from the engine after starting.

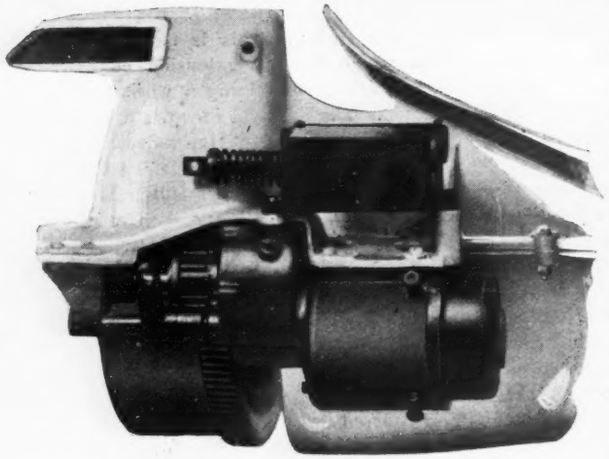
The flywheel weighs 5 pounds and the drive ratio between the worm and the intermediate shaft is about 25 to 1. From this shaft to the crankshaft a further reduction of about 3 to 1, making a total reduction ratio of about 75 to 1. This is an unusually high figure for this purpose, and points to the high-speed characteristics of the motor.

No starting resistance is used, the switch being of the simple knife type actuated by a system of levers or cable. In the Hartford electrical equipment a 12-volt battery is used, as, in the opinion of the designer, a more efficient motor and generator can be made for this voltage than on the 6-volt principle. The motor is connected across the six cells of the battery, while the lamps are supplied on the third-wire principle.

Two sizes of starting motor are made, one being 5¼ inches in diameter and the other 4⅛ inches. The weight of the larger model is 23 pounds. The worm gear and casing, together with driving chain and chain wheel fitted to the crankshaft,



1, Delco as applied to Moon; 2, Entz design of starter for White cars; 3, Gray & Davis cranker on Pathfinder flywheel housing; 4, Westinghouse starter on Hupmobile



Wagner installation on Moline-Knight

weighs about 50 pounds, so that the total weight of the large starter equipment is about 73 pounds; with the small motor the equipment complete weighs about 56 pounds. A 60-ampere-hour battery is used in the larger set and a 30-ampere-hour battery for the smaller.

Jesco—A single machine answers for both starting and lighting in the Jesco equipment of the Jones Electric Starter Co., Chicago. This is made in two sizes of substantially the same construction, except that the larger model has a square casing while the magnet of the smaller machine is cylindrical. Steel laminations are used for the magnet casings of both models. The four poles in each size are punched integral with the casing, and all four carry windings. The end covers of aluminum alloy are bolted up by through bolts passing the entire length of the motor.

A reduction gear of the planetary type is inclosed in one of the end covers. This is made up in various ratios. In the smaller model 8 to 1 is standard and this conjunction with a 3 to 1 final reduction by chain to the crankshaft affords a total ratio between motor and engine of 24 to 1. Two ratios of 8 to 1 and 16 to 1 are provided for the larger size machine. The first is intended for a 3 to 1 final reduction and the second for a 2 to 1 reduction.

When the machine is operating as a generator the planetary is out of action and the armature then runs at the speed represented by the chain drive. The change from solid drive to gear is made automatically and requires nothing further than the movement of the starting switch.

The starting switch of the new models is mounted on top of the motor in a casing which also contains the regulator and cut-out for the generator circuit. The switch is a laminated brush swiveled on a pillar and provided with an external crank for lever connection to pedal or other means of operating.

Field excitation is by series winding when the machine is acting in the motor capacity. When generating a compound winding, one part of which acts on the bucking principle, is in use. The armature carries two windings and a double commutator. Two sets of carbon brushes are used. The motor set consists of four and the generator set of two at 90 degrees. An easily removable metal band surrounds the commutator end cover to provide for brush inspection. The gear casing at the other end is self-contained and is filled with oil for lubrication of the gears and shaft. The latter runs on ball bearings. The machine is usually bracketed at the side of the engine and connected to the crankshaft at the front end through a chain.

Leece-Neville—This year the Leece-Neville starting motor shows an improvement over last year, by the Leece-Neville Co., Cleveland, O., in the matter of accessibility of the brush-gear. Last year's model used two carbon brushes spaced 180 degrees apart, one at the top of the commutator and the other beneath. The consequence was that when inspection was necessary or new brushes were required, the lower brush was difficult to get at. This year the brushes are ranged at 90 degrees and both being in the upper half of the commutator end casing are accessible easily.

The magnet frame is unusual, as it is built up from laminations instead of being a casting. The external shape is rectangular, the two poles being located top and bottom. The end covers completely inclose the machine. The armature shaft runs on ball bearings.

As fitted to the Haynes car, the motor is mounted on a bracket cast integral with the crankcase and is geared to the flywheel through a sliding pinion. The total gear reduction is about 20 to 1. The motor is operated by pressing a button on the control board at the head of the steering pillar. This energizes a solenoid which makes a positive mechanical connection between the clutch pedal and the shifter rod of the sliding pinion. Pressure on the pedal then switches in the motor, and almost immediately after meshes the gear. The voltage for which the motor is designed is 12.

North East—Generating and starting is performed by the same machine in the system of the North East Electric Co., Rochester, N. Y. The motor-generator is a cylindrical model and differs from many compound machines in having only one commutator and set of brushes to act in both capacities. In one model it is mounted at the side of the engine and drives through a reduction gear and chain to the crankshaft. A change-speed is arranged in the gearbox by which the armature can be connected in two different gear ratios to the engine.

In the motor position the ratio between the armature and the crankshaft is arranged from 10 to 1 to 18 to 1, while in the other position, when the car is running and current is required for charging the battery, the speed is cut down to 2 or 2.5 to 1. This ratio is obtained by the chain and thus the inclosed gear is simply cut out for generator purposes and inserted for starting. This change is effected by the use of a clutch, and the sequence of operations are as follows:

The starting switch lever on its first movement engages the gears through the clutch and immediately afterwards the current is shunted around the reverse current cutout, thereby starting the motor-generator operating, the drive being transmitted from the outer end of the reduction gear by chain to the crankshaft.

In another model the drive is direct at from 2.5 to 3 to 1. The dimensions of the motor-generator are: length, 10½ by 6¾ inches diameter. In fitting an extension bracket from the crankcase it is required to seat the combination motor base and gearcase. The starting switch being also mounted on the gearcase contributes to the simplicity of fitting.

Remy—Four cranking motors are offered by the Remy Electric Co., Anderson, Ind., all 6-volt, series-wound, ball-bearing machines, the variety being necessary to supply the demand of the numerous motor types. The core disks, commutator segments and most of the detailed parts are of standard construction. Inspection plates are provided for the examination of the brushes and commutator, and the machines made as simple as possible and yet productive of enough energy to do the work of the more cumbersome apparatus.

The Remy motor-generator takes the name of SL, and is built in two sizes with a number of different windings, depending upon the type of motor in which the system is installed. Two separate armatures are used, the one for the motor being above that of the generator. The features of the double-armature instrument, it is claimed, are absence of intricate mechanism and one point of attachment to the engine required.

When the engine is cranked by the motor and takes up its own cycle, the motor automatically is disconnected through the agency of an overrunning clutch and the generator thrown into operation, so that while the engine is in operation the only moving part of the apparatus is the generator armature. The reduction gears are of the helical type and are fitted to the motor armature and countershaft.

Rushmore—The Rushmore starter is designed by the Rushmore Dynamo Works, Plainfield, N. J., for application to the engine flywheel by a sliding mesh, but differs from other flywheel equipments in that the pinion is keyed solidly to the

armature shaft and slides with it. No intermediate gears are used, and the action of sliding the pinion into engagement with the teeth on the periphery of the flywheel is produced electrically so that no mechanical operation of pedal or lever is necessary when starting.

The sliding action of the armature is effected by displacing it from the magneto field through the agency of a spring contained in the hollow armature shaft. On switching in the motor the current passing around the field coils produces a strong magnetic attraction which draws the mass of the armature into the field and with it the driving pinion on the end of the shaft into mesh with the flywheel.

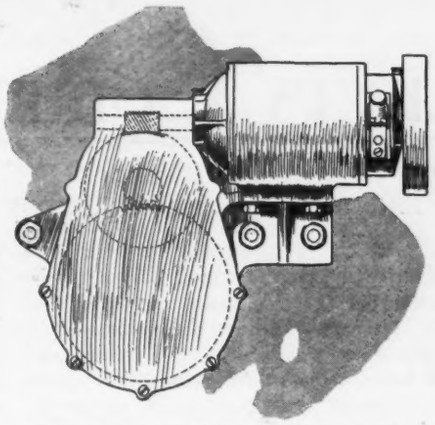
After starting, the danger of burning up the conductor that would otherwise follow a too rapid spinning of the armature if the pinion remained in mesh with the flywheel is obviated by a correct proportioning of the return spring and the windings of the field magnet. This is such that unless the motor is exerting considerable torque, the field is not sufficiently strong to hold the armature up in the operating position. As soon as the engine attempts to drive the motor the torque drops practically to zero and the armature is withdrawn at once by the spring. This year the Rushmore product is remarkable for the compact construction and power for weight.

The special starting switch is arranged for pedal operation to produce the following effects by connection to the motor in conjunction with a starting resistance and a third wire. This third wire acts virtually as a short across the armature on the first movement of the starting switch. The current flows first through a resistance and around the field coils, magnetizing the field only so as to produce a strong attraction between it and the short-circuit armature, which is thereby drawn up with only a slight effort at rotation, until the teeth are fully in mesh.

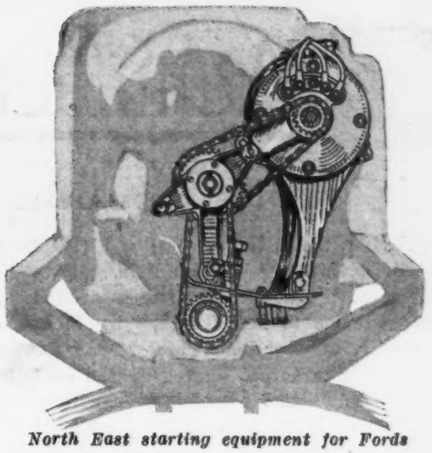
By this time, the second position of the switch having been reached, the third wire is isolated, allowing the current to flow around the armature winding. The resistance is cut out and the motor immediately speeds up.

U. S. L.—Constructionally, the U. S. L. starter, made by the United States Light and Heating Co., New York, differs from all other types. It consists of a large diameter motor-generator, the rotating member of which is utilized as flywheel mass for the gasoline engine, being connected permanently to the crankshaft in the place usually occupied by the plain flywheel. When the car is running, current is taken from the combination machine for charging the battery. When standing, the same windings energize the field and armature for starting purposes. The voltage is 24.

Wagner—The Wagner starting motor, of the Wagner Electric Mfg. Co., St. Louis, Mo., is a four-polar cylindrical design with a cast-steel casing. The poles are screwed into the casing. In the Studebaker equipment the motor is fitted to the side of the crankcase and drives through gears and chain to the front end of the crankshaft. An overrunning clutch is incorporated in the chain wheel on the crankshaft. The motor is designed for a 6-volt circuit.



Hartford starter installed in front of motor



North East starting equipment for Fords

Ward-Leonard—To provide for a wide range of adaptability, the electric starters produced by the Ward-Leonard Electric Co., Bronxville, N. Y., are in three general types. One, the separate starter with internal reduction gear contained in the end cover and a sliding pinion for meshing with the flywheel; two, a double-deck outfit in which the motor is mounted above the generator with the gearcasing at one end connecting the two units. Three, a tandem outfit in which the generator and motor are mounted on a base end-to-end, connected by a reduction gear case.

Numbers one and two of these three types are intended for drive by chain or gear to the crankshaft or magneto shaft. Only one drive pinion is fitted to these models, this making the drive necessary for generating and in addition transmitting the power from the motor to the engine when starting.

In the tandem outfit, which is the latest product of the Ward-Leonard Co., the gears inserted between the two units provide a reduction of 10 to 1. An overrunning clutch is fitted so that when the car is running the starting motor and gears are out of action. When using the starting motor, the drive is transmitted through the overrunning clutch and the armature shaft of the generator and a rotation of both armatures continues until the engine commences to fire and the speed of the generator runs up and puts the one-way clutch out of action.

In the double-deck equipment, exactly the same gear features are used except that they are contained at one end. The reduction here is double, an intermediate shaft occupying a position between the motor and generator shaft, carrying a pinion which meshes with the outer member of the overrunning clutch.

A separate motor with the sliding gear for application to the engine flywheel necessitates the use of a two-point switch which will allow easy meshing. In the Ward-Leonard system the switch is arranged to operate in conjunction with the sliding pinion so that on the first movement of the operating member, which is either a pedal or lever as the purchaser desires, the motor is switch into the circuit through a chrome ribbon resistance in the switch casing until it is turning at a speed that renders meshing easy. Further movement of the pedal cuts off the current momentarily just as the pinion slides into the flywheel teeth and in the final position the current is again switched on full without the resistance.

Westinghouse—Starting motors made by the Westinghouse Electric and Mfg. Co., Pittsburg, Pa., are rectangular machines having four poles but only the upper and lower ones wound. They are supplied either with or without reduction gear in the end cover. The shaft runs on ball bearings and provision is made for adjustment. The gear connecting the motor to the engine is left to the car builder. In the flywheel sliding-pinion type the means of meshing the pinion includes also the cooperation of the starting switch in the following sequence of connections:

The first movement of the pedal switches in the motor through a resistance contained in the switch casing. Then the contact brush of the switch passes through a neutral point momentarily at the instant the pinion slides into mesh. The final position, when the pedal is fully depressed, again switches in the motor, this time directly across the mains without the resistance and the pinion being then in full engagement, the motor exerts the torque necessary for starting the engine.

When fitted with inclosed gear reduction the motor is generally connected to the crankshaft by chain or gear. The smallest model for flywheel attachment weighs only 18 pounds. In one of the larger models the gear reduction is obtained by the use of a small planetary gearset.

Manufacturers' Communications

R. H. Combs Makes Comparison of Costs of Starting Systems' Operation

INDIANAPOLIS, Ind., December 31, 1913—Editor Motor Age—This is in reply to the recent article in Motor Age headed "A Challenge to Mr. Combs," by F. S. Wiemeyer, of the Buick Motor Co., St. Louis, to give actual figures on the cost of lighting, which I am more than willing to do. But a comparative cost "per hour" between electricity and acetylene is impossible. Mr. Wiemeyer overlooks the fact that the user of acetylene pays only for the gas he uses, and the less he uses, the less he pays. The user of electricity, however, pays for his light whether he uses it or not, and may pay an even larger bill if he does not use the light at all. Mr. Wiemeyer overlooks the fact that the user is generating electricity by day as well as by night, and that his expense is in no way determined by the number of hours he uses his light.

Mr. Wiemeyer's contention that the power loss in the medium-priced car should be of less importance than the power loss in the Packard, is easily answered. He overlooks the fact that the lighting load in the two cases is practically identical and that, therefore, the two cars should have approximately the same size of battery, which in turn calls for approximately the same size of generator.

Charging rates are approximately the same in the small car as in the large—in fact, in many small cars which we have tested, the charging rates were higher, owing to poorer dynamo regulation. It is true, as Mr. Wiemeyer states, that the smaller car gets more mileage per gallon of gasoline, but it is also true that the percentage consumed by the generator is far greater and will average between 10 and 12 per cent in cars of this class. Mr. Wiemeyer also overlooks the fact that the addition of weight in the high-priced car is a far less serious matter than in the low-priced car.

When Mr. Wiemeyer assumes an extra gasoline cost of $1.34 for every 1,200 miles of travel and gives the impression that this is the only cost of electric lighting and starting, his charge that I am "trying to mislead the prospective buyer of a medium-priced car" is rather interesting. Mr. Joy of the Packard Motor Co. recently issued statements figuring lighting cost in the same way—that is, he assumed that practically the only cost was the extra gasoline consumed. While not accusing either of these gentlemen of trying to mislead, I do accuse them of overlooking a great many things.

Neither of them allows even so much as 1 cent for lamp bulb replacements, battery renewals, electrical repairs, additional fuel and tire expense due to increased weight, etc. Mr. Joy may be perfectly justified in ignoring these items in the case of the Packard, not only because the proportion of weight added is far less, but also because the whole matter of expense is perhaps of scant importance to buyers of high-priced cars. But why Mr. Wiemeyer should assume that the same thing applies in the case of the man whose purse dictates the purchase of a car at $1,200 or less, needs some explaining.

I think the foregoing will explain why the figures given below do not apply accurately to high-priced cars, but are based entirely upon what the addition of electrical equipment has meant in a car of medium price and moderate power:

Ten per cent to 12 per cent more fuel to operate the electric dynamo.
About 10 per cent to 15 per cent more tire expense.
Five per cent to 10 per cent more fuel on account of increased weight.
At least $12.50 per year for battery maintenance, based on 2 years' battery life.
Three dollars to $6 per year for lamp bulbs.
Five dollars to $15 per year for electrical repairs, based on 2 years' use.

Mr. Wiemeyer, or any other car owner, can easily foot that up to fit his own case, and he can then apportion it, if he desires, to get his cost "per hour."

Battery life in the above estimate is based on the average life of the battery used for lighting alone. The operation of an electric starter in addition will double this item of battery expense in the average case.

I state above that the repair expense is based on 2 years' use. This is for the reason that the owner who escapes this expense during the first year but pays it during the second year, should strike a yearly average.

The expense of acetylene lighting is much more easily calculated. Taking the average case, in which a cylinder containing 40 cubic feet of acetylene serves two headlights, each consuming ½ foot per hour or a total of one foot per hour, and taking $2 as the average price of an exchange on this size of cylinder the country over, the user may easily calculate his expense at 5 cents per cubic feet of acetylene. The expense "per hour" depends upon how much the driver uses the light turned on full, how much of the time he turns the light low, and how much he turns the light out altogether when making stops at night. Any user of acetylene, however, can easily figure his annual expense by multiplying the exchange price in his town by the number of exchanges he uses per year. Some drivers use two exchanges per year, or even less; some eight per year, or even more. Our books show that the average user of acetylene buys between four and five exchanges per year, so that the average annual gas bill is between $8 and $10 per year.

The above is for headlights only. If the driver also uses a small acetylene burner in the tail light, consuming ⅛-foot per hour, his gas consumption will increase about 12 per cent. The use of two ⅛-foot burners in the side lamps, or a total addition of ¼-foot per hour, may or may not increase his gas bill at all, depending upon whether the driver has been in the habit of leaving the head lamps burning full or turned down while the car is standing. In any event, this is easily figured by the user himself.

The expense of the average user for new burners, etc., will not exceed $1 per year. But, let me admit that it may run higher than that, because there are entirely too many users of acetylene who are wasting their gas through leaks in the brass pipe lines. Leakage of this sort is located easily by any user, and the leaks are repaired easily by soldering. A careful testing of the pipe lines at least once a year would more than pay for itself in gas saved. For this added attention, which the average pipe line does not get, Mr. Wiemeyer may add what he likes—my idea of the right addition would be about $1 per year on the average.

From this comparison, as well as from a large volume of statements which we have received from garages, electrical repairmen and owners, it seems evident that in the average case the cost of electric lighting is from three to five times greater than the cost of acetylene lighting.

I am assuming that Mr. Wiemeyer already is familiar with my figures on battery life, repairs, etc., which have appeared in Motor Age during the past six months. He may, however, wish to question my figures, in the above statement, regarding increased car weight, and increased operating expense due to increased weight.

I do not imagine that Mr. Wiemeyer, or anyone else in the trade, will question the statement that motor car weights have been going up since the advent of electrical equipment. The only question is, How much was the weight increased?

Take the three leading medium-priced cars, as an example, two of which have been redesigned in the 1914 models to carry electrical equipment. These two manufacturers are both vigorously advertising their increased engine size, increased tire size, etc., and both these cars show more than the 10 per cent increase in weight which I have provided for above. The third of the trio above referred to, has increased its weight about 5 per cent,

but has not increased its engine, which, in addition to this extra weight, is operating an electric generator consuming 10 per cent of its power.—R. H. Combs, Prest-O-Lite Co.

TREGO POINTS STARTER ECONOMY

Detroit, Mich. — Editor Motor Age — We feel that a few additional remarks besides what we already have said in connection with the test which we made on the Long Island motor parkway, November 29, may give the public a clearer view of the matter.

It has been claimed that the Packard 38 will show less difference than a small car of say 25 horsepower rating in the relative amount of gasoline consumed in pulling electric lights and charging the battery. As a matter of fact, the Packard motor shows 29 horsepower at 640 R.P.M. with wide open throttle, which is at a speed to carry the car at 20 miles per hour.

The conditions on the parkway during the test were such that the trottle was just barely open, so that the power put out by the motor must have been very low and, no doubt, would be far under 10 horsepower.

In the test made at the Packard factory running the car without the generator and then with the generator, operated under normal conditions of fully charged battery and not burning the lights—such as would be the case in the day time—we were unable to measure the difference. The conditions on Long Island, therefore, were made as severe as possible, so that the difference would come within the means of measurement.

It should be borne in mind that under normal conditions, the generator puts out but about 4 amperes when the lights are not burning and the battery is charged. The lights require approximately 10 amperes and the output of the generator is so controlled as to cover the load which may be put upon it.

Let us forget for a moment the size of the car, motor, etc., and set aside the gasoline which it was found was required to pull the generator. This extra gasoline for 10,000 miles cost $7.88. Let us assume that this is carried in a separate tank on the car. Now for this $7.88 worth of gasoline, we have the necessary power to burn all the lights all the time for 10,000 miles and cranking the motor every few minutes, which is in accordance with the conditions of the official test. Under normal conditions, where the lights are not burned for more than one-half of the time and the cranking is not sufficient to discharge the battery, the cost would be far below this $7.88 per year. But, for the sake of argument, let us assume that it does cost $7.88 per 10,000 miles:—what other possible form of lighting could be obtained for this cost and carry ten lights all the time for 10,000 miles What other possible form of equipment would not only furnish the lights but would crank the motor every few moments during this 10,000 miles?

Even under the severe conditions of discharged battery and burning all the lights, the cost is negligible, and under normal conditions, is not to be thought of.—Packard Motor Car Co., F. H. Trego, Research Engineer.

France Offers $10,000 for the Best Kerosene Motor

Test To Be Promoted to Develop Efficient Engine

PARIS, Dec. 27—France is making a strong effort to encourage the use of kerosene on motor cars and particularly for commercial vehicles. It is with this object that a competition is announced with $12,400 in cash prizes for the most efficient kerosene motors applied to road vehicles. The first prize of $10,000 and the second of $2,000 are offered by a petroleum syndicate, and the third prize of $400 is given by the Association Generale Automobile, an auxiliary of the Automobile Club of France. It is this last named body which will have charge of the trials.

The competition will open on October 1 at the new laboratory of the A. C. F. Motors must have four cylinders of 20-30 horsepower, weighing not more than 33 pounds per horsepower, everything included except fuel and oil and their tanks. There will be four bench tests, as follows: 3 hours under full load; 3 hours under half load at the same engine speed as under full load; 2 hours at half speed; 2 hours running light at same engine speed as under full load.

Close record will be kept of the amount of fuel consumed during these four tests. Gasoline will be allowed for starting, on condition that it is not contained in a special tank. In no case must starting operations occupy more than 10 minutes. Having undergone these preliminary trials with a fuel consumption of less than 350 grammes per horsepower hour, and having undergone no repairs, the motors will be qualified for the final test on the road.

Each motor will be fitted into a chassis, the total weight of the vehicle to be not less than 2,645 pounds, without driver, fuel, or oil. Four days will be spent on the road, the cars covering a distance of 621 miles at an average speed of not less than 19 miles an hour. Failure to maintain this average will entail disqualification, but no advantage will accrue from a higher speed. During the road tests no repairs must be made to the car, and at the end of each day's run it will be kept in quarantine. Note will be taken of all stops, of difficulties in starting, of the use of gasoline for starting, of overheating symptoms, of breakages if due to engine vibration, and of any fouling of the plugs and valves.

For the bench tests awards will be made on a fuel consumption basis only. Regularity of running will be considered while on the road, points being awarded from 0 to 20, and consideration being taken of the quantity of gasoline employed for starting purposes. The winning engine will be the one having shown the lowest fuel consumption and proved the most regular on the road.

Entries for this competition are received at the Automobile Club of France until April 1 at the ordinary fee of $30, and at double fees until July 1.

MEXICANS CUT RUBBER OUTPUT

City of Mexico, Mexico, Jan. 1—The rubber production of the state of Chiapas, in southern Mexico, will fall greatly below normal this year, owing to the Mexican government's new tax of 15 cents, Mexican money, a kilo on all crude rubber exported from the country. Many rubber plantation owners have announced that they will not tap their trees this year, because the tax and the low price which they are obtaining for the crude product make the industry unprofitable.

The new tax is levied on the gross weight of rubber exported, the boxing being included in the tax levy the same as the rubber itself, according to the rubber plantation owners. It is stated that the failure to tap the trees this year will not result in a greater production next season, so that the profit lost this season will not be recovered.

A much larger yield could be obtained this year than last, as a result of the growth of the trees. There have been no revolutionary disturbances in the rubber plantation districts of Chiapas, it is stated, and but for the economic difficulties that section of Mexico would be in a prosperous condition. The largest plantations in Mexico are situated in Chiapas, including the Zacualpa plantation, an American property, whose output is about 30,000 pounds monthly.

ASKS RECEIVER FOR PECKHAM

Dayton, O., Jan. 5—George S. G. Peckham, principal officer and stockholder of the Peckham Motor Car Co., of Dayton, Ohio, has applied for a receiver for the concern, which is capitalized at $35,000. Dayton banks hold the notes of the company to the amount of $7,600, and Peckham says there are additional debts of more than $20,000. Mr. Peckham alleges that the assets are as large as the liabilities.

Record for Continuous Block Test Broken by Moline

Knight-Type Motor Runs 336 Hours Without Stop Showing Average of 38.3 Horsepower at 1,117 r. p. m.—No Adjustments Made and All Parts Reported in Perfect Condition

NEW YORK, Jan. 6—The official report of the endurance test of the four-cylinder Moline-Knight motor at the testing laboratory of the Automobile Club of America was submitted to the public today by Herbert Chase, laboratory engineer of the club.

The motor tested made a remarkable record, running for 336 consecutive hours without stop whatever, its spark being set and the throttle wide open. The engine maintained during this long grind an average speed of 1,117 revolutions per minute and delivered an average of 38.3 horsepower at the brake, as the report points out. The lowest horsepower recorded during the run was 36.4. Having completed its long run at exactly 7.01 p. m. on January 2, the motor, without being stopped, was speeded up and developed an average of 53 horsepower for another hour at a speed of 1,678 revolutions a minute, average.

During this test the motor was operated at an average speed of approximately 1,100 r.p.m. and was required to maintain a horsepower average nearly equalling the S. A. E. rating at that speed, the required horsepower being 28.8 while the S. A. E. is 28.16 at that speed. No adjustments of any kind were permitted, neither spark, carbureter or air control being varied. The spark setting was about 62.5 per cent advanced and this was not changed during the run. The drive to the electric dynamometer was through two leather couplings.

The test was the longest and most severe yet given a gasoline motor at the A. C. A. laboratory and after the run the motor was taken apart for inspection of the parts. According to the report, all were without exception in excellent condition. Bearings, sleeves and other working surfaces showed no perceptible wear. The ports in the sleeves were not burnt, and there was only a very slight carbon deposit on the port edges. Cylinder heads and tops of pistons were almost free of carbon, while no looseness could be found in any of the bearings.

During the 336-hour period, 1,744 gallons of fuel were supplied to the engine but it was found at the end of the endurance test that a small hole had been worn through the fuel supply pipe at a point where it chafed on a joint on the crankcase due to vibration. The data later plotted for the fuel curve makes it evident that the rate of fuel consumption gradually decreased for the first 160 hours, and thereafter increased to the end of the test, indicating that the leakage started at or about the 160th hour and gradually became greater thereafter. The average consumption per hour for the first 160 hours was 31.5 pounds. For the last 10 hours of this 160-hour interval it was 30.8 pounds per hour. The actual consumption for the remaining 177 hours of the test is questionable because of the leakage referred to.

The net consumption of oil is figured to have been 131.6 gallons, or 0.39 gallon per hour. The total quantity of oil put into the engine was 170 gallons, but a total of 7 quarts was taken from the motor during and following the test, leaving a net supply of 168.25 gallons. The average overflow was found to be 0.87 pints per hour and assuming this to be correct, the total loss in 337 hours would be 36.6 gallons, leaving the net amount used as given above.

Before and after the long endurance run, a series of short runs was made with throttle wide open and spark set for maximum power. These were to determine the power, friction and fuel consumption of the motor at various speeds. The maximum brake horsepower shown in these tests was 53.6 at 1,682 revolutions a minute.

In order to demonstrate the ability of the motor to run with lower fuel consumption than that shown in the endurance run, and other runs mentioned above, the carbureter was readjusted, and the motor thereafter subjected to a 5-hour run at an average speed of 1,114 revolutions per minute, and a series of short runs at different speeds. The average brake horsepower

MOLINE ISSUES $10,000 DEFI

New York, Jan. 6—Relying upon the showing made by the four-cylinder Moline-Knight in the recent A. C. A. test, the Moline Automobile Co. today issued a challenge to makers of poppet-valve engines to duplicate that record. The Moline company deposited $10,000 to be forfeited to any maker of poppet-valve motors whose engine will duplicate the Moline record, the test to be at the A. C. A. testing laboratory and under the same conditions as the Moline test. The challenge is open to any poppet motor regardless of price, displacement, horsepower or number of cylinders, the entrant to deposit a like amount as forfeit.

PERFORMANCE OF MOLINE-KNIGHT BEFORE AND AFTER ENDURANCE RUN

BEFORE ENDURANCE RUN—BAROMETER 29.85 INS.

Run	Duration minutes	R. P. M.	Torque Pounds. feet	Brake H. P.	B. H. P. Plus Friction H. P.	Gasoline Per B. H. P. Hr. Lbs.	Gasoline Per B. H. P. Hr. Gals.	Temperature Jacket Water in degrees F. In	Out	Range
A	5	294	184.3	10.3	.73	.73	.120	79	133	54
B	5	499	183.8	17.5	19.9	.77	.125	79	147	68
C	5	704	186.4	24.1	28.9	.79	.130	85	160	75
D	5	888	179.5	30.4	36.9	.81	.133	85	157	72
E	5	1103	180.0	37.8	46.9	.85	.140	76	157	81
F	5	1284	175.5	42.9	44.8	.83	.136	77	162	85
G	5	1480	171.5	48.4		.81	.133	80	165	85
H	5	1693	161.2	52.0		.80	.131	82	171	89

AFTER ENDURANCE RUN—BAROMETER 29.91 INS.

A'	7	1682	167.5	53.6		Leaky		66	164	98
B'	5	1488	172.7	49.0		gasoline		65	157	92
C'	5	1307	184.3	45.8	57.2	pipe		69	160	91
D'	5	1104	190.6	40.1	48.8	no		80	160	80
E'	5	909	190.6	32.0	39.2	correct		81	160	79
F'	5	682	188.0	24.4	28.5	fuel		85	160	75
G'	5	486	170.6	15.8	18.3	readings		89	160	71
H'	5	292	176.9	9.8		obtained		93	160	67

Spark set for maximum power at each speed

FRICTION HORSEPOWER

Before Endurance Run

Run	Duration minutes	R. P. M.	Torque Pounds, ft	Fr. H. P.
J	2	468	26.3	2.3
K	2	673	34.7	4.4
L	2	865	39.4	6.5
M	2.5	1113	47.2	10.0
N	2	1267	47.2	11.4
O	3	1371	46.7	12.2
P	5	1098	43.6	9.1
Q	3	676	32.0	4.1

Mean temp. of jacket water, 104° F.

After Endurance Run

Run	Duration minutes	R. P. M.	Torque Pounds, ft	Fr. H. P.
J'	2	489	27.8	2.6
K'	2	697	34.7	4.6
L'	2	888	37.8	6.4
M'	2	1097	44.1	9.2
N'	2	1310	45.6	11.4
O'	2	1416	46.2	12.5
P'	3	1106	41.5	8.7
Q'	2	906	36.2	6.2
R'	2	697	31.8	4.2
S'	2	482	27.3	2.5

Mean temp. of jacket water, 97° F.

for the 5-hour run was 39.8 and the average fuel consumption 0.63 pounds, equivalent to 0.108 gallons per brake horsepower hour.

Following the fuel efficiency test the carbureter with no change in adjustment, was inclosed in an air box, which was clamped between the carbureter flange and the inlet manifold. The sole air inlet to this box was piped to a venturi air meter, and the air consumption of the motor measured under the following conditions:

(a) Carbureter in place, motor running under own power.

(b) Carbureter in place, motor driven by dynamometer.

(c) Carbureter removed, motor driven by dynamometer.

From the air, power and other measurements taken in this run, the volumetric efficiency and other data given were obtained.

The only adjustments made on the motor during the endurance run had to do with the fan and its driving belt. At the 131st hour the fan stopped, due to heating from a slipping belt and gummy oil. The fan was removed, the bearing cleaned and fan and belt replaced. At the 179th hour, the belt was so loose that it hit the fan blades and jumped off. In applying a new belt the thin outer rim of the V-pulley was broken and the belt was removed. The fan, which is one-piece with the pulley, was removed at the 182nd hour. During the 326th hour a new fan and belt were put on, but the belt jumped off after about 10 minutes running, and was not replaced until after the endurance run.

How Motor was Cooled

During the test thermo-syphon cooling was obtained by connecting the motor to a tank of water placed in approximately the same relative position to the motor as the radiator on the Moline car. Sufficient cold water was added to the warm water in the tank to maintain an average temperature of 85 degrees F. of water entering the motor. The average temperature of water leaving motor was 166 degrees F.

The exhaust from the motor was discharged into a short length of 2⅓-inch standard pipe, and thence into an expansion chamber from which it escaped to atmosphere through a long 3-inch vent pipe. The exhaust gas was slightly smoky during a portion of the test.

A blast of air, having a velocity of about 34 miles per hour, was directed against the crankcase of the motor during the endurance and other runs in which the motor was developing power.

There was a wide variation in atmospheric conditions during the test, the temperature of the air blowing on the motor varying from 37 degrees F. to 71 degrees F., with an average of 57 degrees F., while the barometer varied from 28.95 inches to 30.19 inches of mercury, with an average of 29.83 inches. It was noted that the power of the motor increased and decreased as the barometer rose and fell.

New Chairman for Contest Board

R. Kennerdell Succeeds William Schimpf

NEW YORK, Jan. 7,—Special telegram —Richard Kennerdell was appointed to the chairmanship of the contest board of the American Automobile Association at the meeting yesterday of the executive board, succeeding William Schimpf, who has served in this capacity for 2 years and who declined the renomination.

Mr. Schimpf, always an ardent enthusiast, has been closely in touch with racing for many years. Before he became chairman of the contest board, he served as a member of that body and prior to that time was president of the Long Island Automobile Club and also chairman of that club's contest committee.

Mr. Kennerdell is from Franklin, Pa., is an enthusiast in contest matters and once figured as something of a cyclist and has been a pioneer motorist since the introduction of the self-propelled vehicle. He is in position to do considerable travelling and expects to attend the most important race meets in various parts of the country.

The meeting of the executive board was the first to be called by the newly elected president, John A. Wilson, and was well attended, over a scorce being on hand. Several former presidents of the A. A. A. were included. Among the business transacted was the empowering of the national road board to hold a federal aid conference in Washington, in connection with national roads legislation. A commission was appointed to prepare for a mid-summer meeting of the association to be held in the White mountains and members in general will be invited to tour to that gathering. The commission consists of L. R. Speare, S. A. Miles and A. G. Batchelder. They are empowered to add to their number. The Ohio State Automobile Association also was asked to name a director at large to succeed Dr. A. B. Hayl who was dropped as a member of the board of directors.

BIG BENZ BEATS WORLD'S RECORDS

London, Eng., Dec. 22—The first world's records to be beaten under the new regulations of the International Association of Recognized Automobile Clubs, whereby the figures for short distances are now the mean time and speed of the car travelling in both directions, stand to the credit of L. G. Hornsted, who today at the Brooklands motordrome wiped out the old best for the standing start kilometer and ½-mile. He drove a 200-horsepower four-cylinder Benz, with a bore and stroke of 185 by 200 millimeters. It was the indentical car with which Victor Hemery made the records in 1909, though of course, it had had a good overhauling and tuning up at the Benz factory and Hornsted had made an attempt a week previously, but had been unsuccessful owing to the defective working of the clutch, which was slipping through an excess of oil. Today, too, he was by no means free from this trouble, and, furthermore, the rod connecting the acceleration pedal jammed somewhat with the steering gear. Had he been free from such mechanical drawbacks his speed would no doubt have been terrific. As it was he covered the kilometer in the normal direction in 29.62 seconds, and the best of his four attempts in the reverse direction came out at 31.19 seconds, so that the mean time was 30.405 seconds, equalling 73.57 m.p.h., as compared with the 31.326 seconds, or 71.409 m.p.h. made by Hemery (of course, in one direction). Travelling the normal way of the track, Hornsted covered the ½-mile in 25.49 seconds, also from a standing start, and the best of his three attempts in the opposite direction was accomplished in 25.6 seconds. His mean time was therefore 25.545 seconds or 70.47 m.p.h., whereas the old record stood at 25.566 seconds, or 70.406 m.p.h. The weather was rather misty, but there was no wind.

CASES AGAINST GROSSMAN DROPPED

New York, Jan. 3—The two cases in the United States district court of the southern district of New York, William Barber vs. Lowe Motor Supply Co., and C. A. Mezger, Inc., against the Emil Grossman Mfg. Co., Inc., have been discontinued without costs to either party. The Emil Grossman Mfg. Co., Inc., has acquired a part ownership in patent 732,032, issued to William Barber, Brooklyn, N. Y., for a spark plug with an insulator consisting of a combination of porcelain and a less fragile substance. This patent was the basis for a suit started by William Barber against the Lowe Motor Supply Co. for selling Red Head plugs. The Grossman company is interested in Red Head plugs, and since it is one of the owners of the patent the suit against the Lowe Motor Supplies Co. has been discontinued, as the Red Head plug ceases to be an infringement because of the new interest in the patent. The Mezger suit involved an alleged infringement of C. A. Mezger's patent.

LINCOLN AT $500 APPEARS

Detroit, Mich., Jan. 6—The first standardized model of the Lincoln Motor Car Co. of Detroit made its bow to the public on the streets here Monday. This car has been built to the ideas of H. D. W. Mackaye and its design includes a single compartment open body Renault type hood and radiator and wire wheels. The car weighs considerably less than 1,000 pounds, carries a four-cylinder motor and lists at $500. It is said to have made over 45 miles an hour on rough, frozen roads.

Ford Company to Divide $10,000,000 Among Employes

Profit-Sharing Plan Announced Whereby Minimum Wage for Males Is Advanced from $2.34 to $5 a Day—Hours Decreased from 9 to 8 Daily

SECRETARY OF COMMERCE REDFIELD PRAISES FORD'S GENEROSITY

Washington, D. C., Jan. 6—Special telegram—A "social advance" and a "recognition of the value of a man in industry," were Secretary of Commerce Redfield's characterizations today of the Ford Motor Co.'s plan to distribute $10,000,000 to its employes.

"Some people will say Ford can't afford to do that," said the secretary. "That kind of talk is foolish. It doesn't depend on whether he can afford it or not. I see in this, as in the removal of Morgan members from directorates, a great step forward. It is a social advance, recognizing the value of men which may be, and I hope is, epochal.

"One must not discuss the details of such a plan, because this may only be done by one who knows the details of the business; but the broad principle involved of recognition of the essential value of the men and the equity of appraising that value at its true worth is entirely sound."

DETROIT, Mich., Jan. 5—Twenty-two thousand, five hundred employes of the Ford Motor Co., working in the main plant here and in the several assembling branches throughout the world, came to the happy conclusion that 1914 is to be a year of promise and prosperity for them today when Henry Ford, founder and president of the concern that bears his name, announced that approximately $10,000,000 will be divided among them during the next 12 months under a profit-sharing plan of his own conception.

In announcing that almost one-half of the annual earnings of the company in the future would be given to his army of employes, President Ford outlined the features of his altruistic plan, which are as follows:

Raises minimum wage for male employes of more than 22 years of age from $2.34 to $5 a day, new wage scale to go into effect January 12 and will affect over 90 per cent of the men immediately.

Workers receiving more than the minimum wage at the present time also will be given their share of the profits.

Younger men, having relatives dependent upon them, will be included when the new wage scale is made out.

Reduction of the number of working hours per day from 9 to 8 and the addition of 4,000 to 5,000 employes so that three shifts can be worked.

Under the new system of remuneration, two classes of workers are provided for—one including the average workmen whose daily wages will be more than doubled and the other taking into consideration the more skilled employes who now receive from $6 to $7 a day but will be given an increase as befits their services as experts. Another plan is being devised that will swell the earnings of the 300 women employes who now receive a minimum wage of $40 a month.

The increased wages are to be paid monthly instead of yearly. No increase in the price of the company's product will be made in order to secure funds to make the profit-sharing plan possible. The $10,000,000 will be deducted from the dividends of the seven stockholders.

In addition to raising the pay of his workers, Mr. Ford hopes to so arrange the work at his plant that if it becomes necessary at any season of the year to lay off men, the layoff shall come in July, August and September when the employes can readily obtain work in the harvest fields and lose little by the temporary cessation of production.

"Henry Ford is the originator of the plan," said James Cousins, general manager, speaking for the manufacturer and chief owner of the plant which bears his name. "He believes there has been too big a division between capital and labor and that labor has not shared to the extent it should. Therefore we began to devise a profit-sharing scheme. It is not an increase in pay, to put it in those terms, but it is a plan whereby every employe in the plant will share in what the plant and its branches produce. It will bring their monthly pay check up, and we believe will help improve the standard of our employes."

In explaining the plan Mr. Ford says that it is one of "social justice." The employes will not be subject to preëmptory discharge by the foreman but in case a foreman feels that a man is unfitted for work in his department he will be transferred to another department until it is definitely established that he is entirely inefficient. Along this line a new department will be created, known as the sociological department. Just what the duties of this department will be cannot at this time be definitely stated, but it's functions will be very broad. Not only will it include the work of transferring or placing men in the departments in which they are the most efficient, but it will also look to the conduct of the men outside of working hours. It will attempt to guide these men so that the new prosperity will not result in their own injury. If a man cannot be brought to a realization of his economic duties there is no question but that after a reasonable trial his place will be given to a man who will.

The announcement brought some 10,000 men looking for work at the Ford plant this morning. The company, however, announced that no men would be hired at present.

CHANGE IN KEETON PLANS

Detroit, Mich., Jan. 5—The Keeton Motor Co., which has been manufacturing Keeton cars for the past year, has just completed arrangements whereby the American Voiturette Co. of Detroit, manufacturer of the Carnation, also will manufacture and sell the Keeton car. Charles B. Shaffer, president of the American Voiturette Co., states that, owing to the field for a car of the class and type of the Keeton being somewhat limited, it has been decided best to have the Keeton car made in conjunction with the Carnation.

The officers of the American Voiturette Co. are as follows: C. B. Shaffer, president; H. H. Newson, vice-president and general manager; C. B. Lewis, secretary and treasurer; C. P. James, assistant secretary and treasurer.

The outward appearance and name of the Keeton remain unchanged, while the mechanical construction and details have been refined, and the personnel of the organization has been completely revamped.

INCREASE OF CAPITAL BY G & J

Indianapolis, Ind., Jan. 5—Notice has been filed with the Indiana secretary of state that the G & J Tire Co., which is the Indianapolis branch of the United States Tire Co., has increased its capital stock from $1,000,000 to $2,000,000. The additional capital is in preferred stock. The Western Motor Co. of Marion, Ind., has filed notice that its capitalization has been reduced from $400,000 to $1,000. The Rutenber Electric Co., Logansport, has issued $35,000 worth of preferred stock.

WIRE WHEEL SUIT STARTED

Philadelphia, Pa., Jan. 6—Rudge-Whitworth, Ltd., of England, and the receivers of the Standard Roller Bearing Co. of Philadelphia have brought suit against

the Houk Mfg. Co., Buffalo, N. Y., to restrain the latter concern from using the name Rudge-Whitworth and also to prevent it from selling wire wheels embodying the features covered by the Rudge-Whitworth patents. This suit is the first brought under these patents in this country. The receivers of the Standard Roller Bearing Co. and the English company announce that they will bring suit against all infringements in this country.

LITIGATION BRINGS A RECEIVER

Springfield, O., Jan. 5—J. K. Williams has been named receiver for the Yost Gearless Motor Co. of Springfield, upon the application of George L. Miller, secretary and general manager. It is believed the company is solvent, but the request for the receiver was made for the purpose of protecting the interests of the company as well as the creditors. Heavy expenses in litigation over certain patent rights is given as the cause for the receivership. The company is capitalized at $25,000.

LEXINGTON AND HOWARD MERGE

Connersville, Ind., Jan. 3—The Lexington-Howard Co. has just been incorporated here by E. W. Ansted, J. E. Houston, F. I. Barrows, G. W. Ansted and Emery Huston, all of whom are local men.

This new company is the purchaser of the good will and trade name of the Lexington Motor Car Co., incorporated in 1908, and of the good will and trade name of the Howard Motor Car Co., and is the direct successor of the Central Car Co.

The Lexington-Howard Co. is capitalized for $150,000. E. W. Ansted has been elected president; J. E. Huston, vice-president; F. I. Barrows, secretary-treasurer; F. B. Ansted, general sales manager; J. C. Moore, chief engineer, and Emery Huston, advertising manager.

Two distinct lines of cars will be offered to the trade: a four-cylinder line called Lexington and a six-cylinder line called Howard. The Lexington-Howard Co.'s minimum will be 500 cars per annum.

TO SELL INTER-STATE ASSETS

Muncie, Ind., Jan. 5—Creditors of the Inter-State Automobile Co., Muncie, Ind. have agreed that the property of the company shall be sold at a public sale February 5. The agreement was reached at a meeting held a few days ago by the creditors with Harry C. Sheridan, referee in bankruptcy.

REORGANIZING FACTORY FORCE

Louisville, Ky., Jan. 3—In carrying into effect a general reorganization of the Kentucky Wagon Mfg. Co., officers of that concern have just completed a reorganization of the factory force, with the elimination of four or five foremen of the departments, according to R. V. Board, president. The working force has not been reduced, and the factory which has been closed for about 2 weeks for an inventory, will resume operations Monday. It was announced that no further changes have been made, but reorganization of the sales department, soon to be undertaken, will become effective about February 1.

BUY PLANT AT NEW ALBANY

Louisville, Ky., Jan. 5—Ferdinand Kahler and his associates in the Ohio Falls Motor Car Co. have purchased from Joseph Bruns, receiver of the concern, the factory plant on Vincennes street, New Albany, Ind., which failed to sell at receiver's sale in November. The price paid was $26,500, the purchasers paying $1,500 and assuming liens aggregating $25,000. It is understood when the workmen have turned out the small number of cars which were unfinished at the time of the receivership, the factory will not be operated as a car manufacturing plant.

MILWAUKEE PLANT RESUMES

Milwaukee, Wis., Jan. 5—The former plant of the Milwaukee Motor Co., at 32d and Burleigh streets, Milwaukee, resumed operations today under the management and ownership of the Harris Bros. of Chicago, owners of the Chicago House Wrecking Co. The plant has been idle since the middle of June, when the company went into bankruptcy, due principally to internal difficulties. The Harris interests bid in the plant for $86,000 and intend to rehabilitate the property as a going concern. As soon as it arrives at a profit-making condition it will be disposed of. About 125 men are employed at this time and the line of products is practically identical with the output of the bankrupt Milwaukee Motor Co.

TO MAKE ELECTRIC INDOOR TRUCK

St. Louis, Mo., Jan. 5—The Electromobile Co. of St. Louis was organized during the past week to manufacture an electric-driven indoor truck that, it is claimed, will be a great aid to the larger wholesale houses and manufacturing plants in carting about materials to different parts of their buildings. The company was organized by Sanford J. Bernheimer with a capital stock of $100,000, one-half of which is already taken. Ralph Kalish, a patent lawyer, is secretary and treasurer of the company. The truck has a carrying capacity of 2,000 and a tractor capacity of from 5,000 to 8,000 pounds. It measures 8 feet overall, with a loading space of 7 feet. Bernheimer formerly was connected with the General Vehicle Co.

MANITOBA'S MOTOR GROWTH

Winnipeg, Man., Jan. 2—Statistics issued by the municipal commissioner's department for the province of Manitoba show an extremely satisfactory gain in the number of motor-propelled vehicles in use in the case of passenger vehicles, the increase amounts to a little over 38 per cent as compared with the number of cars in use at the end of 1912.

Commercial vehicles also show a distinct gain, a little over 100 new machines having been put into service during the 12 months ending Tuesday. Motorcycles have shown an even greater increase, their number being added to by over 55 per cent in the past 12 months.

HARTFORD INCREASES CAPITAL

Hartford, Conn., Jan. 3—There has been filed in the office of the secretary of state by the Hartford Rubber Works Co. a certificate on increase of capital stock from $1,000,000 to $2,000,000. The number of shares has been increased from 10,000 to 10,000 preferred and 10,000 common stock, each share of par value of $100. The holders of the preferred stock "shall be entitled to a dividend of 6 per cent, payable annually or quarterly which shall be cumulative and payable before any dividend shall be set apart or paid on the common stock."

SINGER AGAIN P. & S. PRESIDENT

New York, Jan. 5—At a special meeting of the board of directors of the Palmer & Singer Mfg. Co., Clyde D. Knapp retired from the presidency and Charles A. Singer, Sr., was elected to fill the vacancy.

Briscoe Locates Plant at Jackson

De Lisser President of American Company

NEW YORK, Jan. 6—Benjamin Briscoe's new car will be built in this country in Jackson, Mich., the Lewis Spring and Axle Co. becoming the American manufacturing end of Briscoe Freres. The car, a five-passenger machine, 105-inch wheelbase and four-cylinder motor, developing 30 horsepower, made on French lines, is to be sold for $750. This car will be marketed also with Westinghouse self-starting and lighting equipment for $900. The Briscoe schedule calls for cars to be delivered starting March 1. It is planned to build for the 1914 market 7,500 cars of the Briscoe type.

At a meeting today of the Briscoe Motor Co., which has its executive offices in this city, and its factory in Jackson, Mich, Horace de Lisser, of the Ajax-Grieb Rubber Co., was elected president and general manager. Mr. de Lisser, will continue his present connection with the Ajax-Grieb Rubber Co., as well as looking after the Briscoe company. W. F. Smith, was elected vice-president and sales manager and L. E. Latta, secretary and treasurer. Both of the latter were associated with the United States Motor Co. under Benjamin Briscoe, who is president of the Briscoe Motor Co.

Show Time Finds Business Good in Big Trade Cities

Chicago Retailers Selling More Cars Than at Corresponding Time a Year Ago—Boston Also in Optimistic Mood—Similar Reports from Cleveland, Detroit and Cincinnati

CHICAGO, Jan. 5—So far as local dealers in motor cars are concerned, the term "Happy New Year" neither is a platitude nor a bromide. It almost approaches a realized promise of prosperity for 1914. There are few Lugubrious Blues along Chicago's motor row. Optimism is at the wheel, the gears have been advanced through financial stringency and political uncertainty and the great vehicle of business is traveling along at high speed.

According to the majority of the dealers, the demand for motor cars in Chicago and environs never was as great as it is at the present time. There is every evidence to lead them to believe that the passage of the currency bill has relieved materially the tightness, fancied or real, of the money market that had a tendency to constipate sales and delay shipments to branch agents in the waning days of late-lamented 1913. Even the bankruptcy clouds, that broke over and destroyed a score or more of manufacturers during the past year, are looked upon as a sort of blessing in disguise by those local agents affiliated with makers that had lightning rods raised and weathered the storm.

"Measured by the number of motor car sales, 1914 will be a much better year than was 1913 because of better business conditions," is the prophecy of Fred Warner, manager of the local Buick branch. "In Chicago and surrounding territory we will sell more cars than in the past year. At the factory, the production for the months of November and December exceeded 8,000 cars and the manufacturing schedule for the winter and spring seasons of 1914 calls for a monthly output of 4,200 machines. Increased production means greater sales activity and we are not building a larger number of cars without the knowledge that there is a market for them."

Local representatives of both the Chalmers and Hudson, playing the oracle role for the dealers in medium-priced cars, already have started to catch their bit from 1914's horn of plenty.

"I have not the slightest doubt but that 1914 will be a most profitable year for us," James Levy of the Chalmers Motor Car Co. of Illinois declared. "Since the new models were announced in August, we have enjoyed the best business locally in our existence. I take off my hat to Chicago. It is the greatest motor car selling center in the country and more business radiates from it than from any other city in the United States.

"Speaking in regard to general conditions, I believe that the manufacturers who have been building for the future will continue to enjoy the same good business that they have in the past, but that the factories that have only been building for the time being will have difficulty in marketing their products.

"That the demand for motor cars is greater than ever before is shown in the number of October shipments from the Chalmers factory. In October, 1,111 cars were sent out by the maker, 251 more cars than in any one month since the organization of the Chalmers Motor Co."

Louis Geyler, local distributor for the Hudson, bases his optimism on statistics.

"I am just 3½ months ahead of last year," he said. "My cash business from July 1 to January 1 is equal to that from July 1 to April 15 of the year previous. My December sales totaled forty-six cars and that forty-sixth purchase just doubled my sales for 1913 over those of 1912. The clouds on the horizon are imaginary. The financial depression, if there is such a thing, is unnatural. To treat in epitome the motor car business, the stronger concerns are getting stronger and the weaker concerns are getting weaker."

Prosperity and 1914 will not make a simultaneous entrance, according to Henry Paulman, president of H. Paulman & Co., Chicago agent for the Pierce-Arrow.

"Within the next 60 days, I look for business conditions to be normal once more," he declares. "It will take about 30 days for the various new laws to adjust themselves and another 30 days to secure the new railroad rates. That new currency bill will affect Chicago more than any other city is my belief because Chicago is in the heart of the country's agricultural zone. The new currency bill will help the farmer and he, in turn, will help the city man and the railroad.

"The dealer in the high-priced car should not fear any untoward results from the lowering of the tariff on foreign machines. In the modern motor car market, Europe cannot compete successfully with America. We can give the car purchaser more value for his money and better service and in our products are embodied more progressive mechanical ideas."

Voicing the optimism of the local dealers in electric cars, D. E. Whipple, manager of the Chicago branch of the Anderson Electric Co. says:

"In Chicago and Evanston, the greatest of Detroit electric markets, we plan to sell 300 cars in 1914 and if we realize such an ambition, our sales for 1914 will double those of 1913. Advance sales and orders more than encourage us to believe that we will not be disappointed. The factory plans an output of 2,500 vehicles for this year, twice as many as were built in 1913. There is a constantly growing demand for the electric, a demand forced by the public and not the manufacturer. The consumer is coming to the realization that the electric is the ideal car for town and suburban use."

Boston Reports Business Good This Winter

BOSTON, Mass., Jan. 3—Motor dealers in Boston who have been in business for some years handling prominent lines of cars state that the general talk of business depression has not seemed to affect them to any great extent. There has been a slight falling off the last few weeks which is the usual condition just preceding the new year, but the general average for the season shows that the dealers have done a good business in New England.

In the higher-class—such as Pierce, Packard and Peerless—the dealers give a good criterion, for they handle both passenger cars and trucks. All three lines show a larger total of business up to November 1 of this year than for the entire 12 months of 1912. In this same class the Locomobile, too, with its trucks and cars is ahead of a year ago. The Stevens-Duryea, selling passenger cars alone, has increased its business. Then there is the White that has just moved into one of the largest sales and service departments in the city, an evidence of its prosperity. The manager stated that his truck and car sales were larger. The Stearns also is gaining, and additional salesmen have been put on.

The Marmon sales are better than a year ago, and they are expected to be even more so for the local distributor, F. E. Wing, has just leased one of the biggest buildings in the Back Bay, the structure recently completed for the Lozier. He said business looked too good to stay down town. The Cadillac is selling well, and last week it had a special show. The velvet decorations alone cost $1,000 and they were purchased in New York because Boston could not supply them. The cost of the show was at least $2,500 and if the company was not doing good it would be retrenching.

The Buick company had its allotment all sold some time ago, not a machine being left, and it has been selling the new cars readily. A few days ago eight runabouts were sold to the fire department on one order. The Hudson, Rambler and Chalmers report business good and the prospects better. As for the Ford, that car is selling fast enough to keep the local plant very busy. The Studebaker agency has been making good since

it was changed from a factory branch. The Overland is doing exceptionally well its New England dealers reported at their annual dinner Saturday night. In the truck line the Garford, G.M.C., General Vehicle, Autocar, International and Kelly-Springfield report sales good.

That business has been good is further borne out by the registration figures. Up to December 1 there had been 12,528 more motor vehicles registered than in 1912. In the same period there had been 1861 more commercial vehicles listed. Moreover as showing that there has been a continual activity in the motor industry, there were 1970 passenger cars registered during the period between November 1 and December 15, or more than 300 cars a week. During the same time there were 356 trucks registered. When it is considered that the last 2 months generally is considered slack, people holding up registrations, this is good evidence that the business depression has not badly affected the Boston dealers.

The reason why the business has not toppled over as many expected is due to the fact that the agencies and branches have gone after business all over New England. Some of the dealers went after business themselves into small places in New Hampshire and Vermont, and they were surprised to find families without cars that could readily afford them, but which had not been approached in the proper manner, especially by representatives of big cars. The conditions for 1914 look very good, for the business has now settled down to a basis of going out and getting orders.

Future Most Promising, Cleveland Makers Report

CLEVELAND, O., Jan. 3—At no time in years has the industry in Cleveland given more promise than at present. Business is unusually good just now rather than slack and all the local dealers are in accord that the alleged depressing condition supposed to have centered in the middle west is a fallacy so far as this territory is concerned. Whatever condition exists with the manufacturers—and in the main it is for prosperity—no doubt it is due to the period of the year, business revisions and policy changes.

"There is nothing fundamentally wrong and if there is any slack whatever it certainly must be accounted for by the national political situation and the time of year when all big manufacturers are checking up," said Charles W. Mears of the Winton Motor Car Co. "Our own sales are increasing and we have every reason to feel pleased with the situation. Prospects are even brighter and after the first of the new year the industry will see a pronounced boom."

Up to November 1 the Baker Motor Vehicle Co. catered to more than 200 concerns and handled a business running more than a million and a half dollars. The company has had remarkable success with electric trucks and its directors believe business for the ensuing 6 months will go far beyond that of the same period last year. Eight big business houses over the country placed orders for trucks in the past month, one of them for ten vehicles.

Walter C. White of the White Co. finds the situation in even better shape than at this time last year and predicts prosperity for months to come.

Directors of the F. B. Stearns Co., at an adjourned meeting December 23, declared a cash dividend of 10 per cent on the capital stock of the company. This is in addition to the 8 per cent cash dividend paid July 1, 1913. The Stearns company has no preferred stock and no bonds or mortgages outstanding.

As another evidence of prosperous condition the New York Central Line has recognized a promising future and on December 23 secured permission from the Ohio utilities commission to issue equipment trust certificates for more than $10,000,000 to buy 500 motor car shipping cars and other equipment.

Bob Allen, distributor for the Velie, is having great success in the way of 1914 sales. The first week of December he placed cars with twelve Clevelanders.

The sentiment of some Cleveland dealers:

"Never better and improving steadily."—Brooks-Norton Motor Sales Co.

"One hundred per cent better than this time last year. Our average is growing and prospects are brilliant."—Cadillac Automobile Co.

"Business really is just beginning to get good."—Chandler Motor Car Co.

"November was our best month and December will be as good."—A. R. Davis Motor Co., handling the Studebaker.

"Sales are increasing daily."—Ford Motor Co.

"We could not wish for better conditions"—Jackson Motor Sales Co.

CINCINNATI DEALERS DOING WELL

Cincinnati, O., Jan. 3—While the year was not a very successful one for Cincinnati manufacturers, the dealers of this city have little of which to complain. Most of those who handle high-grade cars report business as good. It is true that at the present time there is very little doing, but that is nothing out of the ordinary here, for the last 2 months of the year always have proved slow ones in this vicinity. Once the season in shows is on it is expected that business will pick up.

The most optimistic report from local headquarters come from Harry S. Leyman, president of the Cincinnati Dealers' Association and district manager of the Buick company. Mr. Leyman has his books to show that he disposed of 500 more cars this year than he did last, the increase being over 75 per cent. He has orders in for more cars right now than the factory is willing to let him have.

There are more dealers in Cincinnati now than ever before. Few cars are not represented. The majority of the reports going into the factories certainly overshadow some of these pessimistic remarks, at least that is the way the local condition sizes up.

INCREASED BUSINESS IN DETROIT

Detroit, Mich., Jan. 5.—In answer to inquiries put to a number of Detroit's leading motor car companies, the reports have shown a very healthy condition of the industry. Mr. Hills of the Packard says that December business equaled that for December, 1912. The Packard dealers have reported to the factory that the business outlook for this spring are excellent.

Although the Cadillac company could not give figures for December alone, the records show that up to December 28, 1912, it had shipped 4,711 1913 models, while up to the same date of 1913 it had sent out 7,124 1914 models. This is an increase of 2,413 cars.

From the Hudson sales department comes the report that December, 1913, was the best in the history of the concern and that the sales for this period exceeded those of the same month last year by $200,000.

PARTS MAKER TALKS PROSPERITY

Milwaukee, Wis., Jan. 3—Conditions in the Milwaukee territory as regards motor vehicles and the parts manufacturing industry are explained by John P. Kelley, of the A. O. Smith Co., Milwaukee, whose annual review of the trade says in part:

"The sale of motor cars during the calendar year just closed has been the largest of any year of the industry, despite a falling off during the last period because of the unsettled financial condition. The industry today is on a more sound financial basis and in better condition than ever before. True, there have been a number of failures, but in nearly every instance the firms affected have been those without sufficient working capital or whose manufacturing methods have not allowed them to meet the keen competition which is a part of this industry.

"More lower-priced cars are being manufactured than ever before, and the advent of the cyclecar will, it is predicted, make it possible for everyone, including the average working man, who has the desire, to own a car. The parts and accessory makers are having a very important and far-reaching effect in this development, by reason of the fact that not only the car builders are better realizing the advantages and economy of using parts made by the part makers who are specialists in their respective lines, but the buying public is fast being educated to the same realization of these advantages.

"Commercial trucks are only at the beginning of their real development."

The Readers' Clearing House

TESTING BY USE OF PRONY BRAKE

Horsepower May Be Obtained by Use of Typical Absorption Dynamometer

BERWICK, N. DAK. — Editor Motor Age—Which is the more economical in summer in using gasoline, hot or cold air? Which produces the more power?

2—What is the difference between brake and the original horsepower of an engine?

3—How is the brake testing done?—H. W. Arnold.

1—With the present low grade of fuel it is advisable to use hot air and also a hot-water jacketed carbureter in order to assist in vaporization of the fuel to get more power.

2—Motor Age never has heard of the expression original horsepower. Perhaps you mean indicated horsepower. The indicated horsepower of a motor is the power delivered by the gasoline to the pistons and takes into consideration the mean effective pressure in the cylinder. The formula used usually to express indicated horsepower is,

$$\text{horsepower} = \frac{PLAN}{33{,}000}$$

where P is the mean of effective pressure in pounds per square inch, L is the length of the stroke in feet; A, the area of the top of the piston in square inches and N the r.p.m. multiplied by 2.

Brake horsepower is that measured at the flywheel of the motor and is the useful work done by the machine.

3—Brake testing with a Prony brake is illustrated in Fig. 1. This brake consists of a wooden lever with a pan at one end and a wooden block connected by long bolts at the other. The block and one end of the lever is curved so as to fit around the flywheel. To measure the power of the motor at a certain r.p.m. weights are added to the pan and at the same time the handles shown are screwed downward so as to tighten the grip on the flywheel. When the lever remains in a horizontal position while the r.p.m. of the shaft remain constant, the test is finished, except for certain calculations. The r.p.m. of the flywheel is measured with what is called a tachometer, the weights, W used in the test are known and the length of the lever L is known, then by the formula horsepower = 0.0001904 L W R the horsepower is found. L is the length in feet of the lever from the flywheel center to the point shown; W, is the weight in pounds on the pan and R, the r.p.m. of the flywheel.

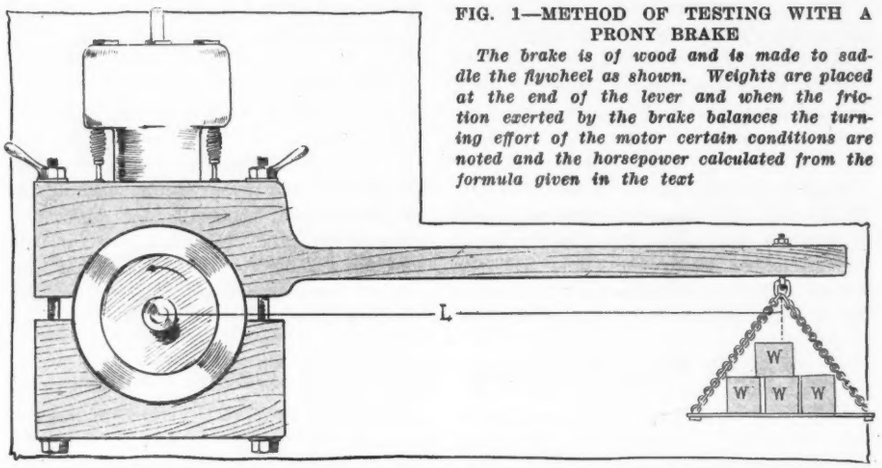


FIG. 1—METHOD OF TESTING WITH A PRONY BRAKE

The brake is of wood and is made to saddle the flywheel as shown. Weights are placed at the end of the lever and when the friction exerted by the brake balances the turning effort of the motor certain conditions are noted and the horsepower calculated from the formula given in the text

Sometimes instead of having a pan and adding weights a scale is fastened to the end of the lever by a cord or wire attached at one end to the floor. While one man is screwing down on the handles another watches the scale and lever while a third attends to the throttle and also opens the auxiliary air valve of the carbureter wider and wider with the speed increases. The tachometer is driven usually by a belt from some auxiliary motor shaft. The fan-belt pulley is commonly used for this. When the tachometer cannot to read by the operator at the brake a mirror is conveniently placed so that the face of the tachometer is reflected in the mirror.

Questions Answered and Communications Received.

H. W. Arnold.....Berwick, N. D.
Subscriber.....West Union, W. Va.
R. O. Everist.....Waumande, Wis.
Jesse Wootton.....Chicago
An Interested Reader..Plainville, Conn.
A. D. Carpenter....Sauk Center, Minn.
Bert Jordan.....Cleveland, Okla.
V. R. W.....Price, Utah
W. C. Herbert.....Orangeburg, S. C.
A Subscriber.....Wabash, Ind.

WANTS TO MAKE HEADLIGHT GLASS

Will It Pay to Start a Business?—Demand for Product Dictates

West Union, W. Va.—Editor Motor Age—Since the agitation for reduction or removal of glare from headlights, Mr. Sanborn of Millersport, O., suggested amber glass for headlights in a recent issue of Motor Age. Pale amber for headlights immediately appealed to me and I wrote Mr. Sanborn for information on where to obtain amber glass in the right form. There are millions of amber bottles made in the United States, but none in the form of window glass, in which form it must be for headlights.

Mr. Sanborn's solution was to stain the glass with such stain as photographers use. Such stain will not adhere to glass except when coated with an emulsion of some sort, and the emulsion will not stand the heat of the light. I am well acquainted with the window glass situation throughout the United States and if I had the proper assurance that there would be a worth while demand for pale amber glass for headlights, I could arrange with a manufacturer to install an amber department. I would like the opinion of Motor Age on what proportions the demand for such a glass would probably reach? The expense of equipping an amber department would be no small matter, but any degree of density desired in the glass could be obtained.—Subscriber.

At the present time local legislation has forced the motorists to adopt some means of preventing headlight glare and since the selection of the proper medium is a personal affair, Motor Age could hardly give any figure as to the expected demand for amber glass. However, it may be stated that a number already are using amber and all that is necessary is to show owners that amber will do the work and the demand is created.

SPEEDOMETER DRIVE FROM SHAFT

Instrument May Be Operated From the Universal Housing

Waumande, Wis.—Editor Motor Age—What becomes of the electric current after jumping the points of the spark plug?

2—What make of motor does the Jackson use, and who is it made by?

3—Could the speedometer be driven from the propeller shaft in a 1914 Reo, and with what arrangement? What size pinions would be necessary?

4—Which car has the more power considering the weight of the cars, the Reo touring, or the Imperial model 32?

5—Are there any motors made with about 10-12 horsepower with a unit power plant, three speeds forward and reverse that could be used in a cyclecar?—R. D. Everist.

1—It returns to its place of generation through the medium of the metal of the motor. In other words, it is grounded.

2—The 1914 Jackson car uses a Northway motor made by the Northway Motor & Mfg. Co., Detroit, Mich.

3—It is possible to drive the speedometer from the propeller shaft. The Stewart speedometer requires a gear with 34 teeth and a pinion with 30 teeth, both having a pitch of eight. The gear is driven from the universal.

4—There are many things aside from weight and cylinder dimensions which determine the power of the car. The design of all the parts, the wind resistance offered, and the method of handling all enter into car performance. The only certain way to determine which has the most power is to take both on the road and compare their abilities.

5—There are none marketed at present in this form which would be light enough for cyclecar use.

Meaning of Air-Bound

Chicago—Kindly explain the meaning of the term air-bound as applied to motor cars.—Jesse Wootton.

Air-bound refers to the checking of the

flow of a liquid due to the access of air to the liquid-carrying device. It is used often when referring to pressure gasoline feed systems becoming inoperative due to an air leak in the line or tank.

WOOD ALCOHOL AS DECARBONIZER

Reader Found to Get Good Results—Comments on Car Inspections

Plainville, Conn.—Editor Motor Age—Having used wood alcohol on the radiators of various cars for several winters without experiencing any bad results, I was very much surprised upon reading that wood alcohol created formic acid when heated, and that the said formic acid was injurious to the brass used in radiators.

Last winter a piece of brass used in making radiators five one thousands of an inch thick was fastened to the strainer, hanging down into the radiator directly in the path of the incoming hot water and was allowed to stay throughout the winter while 30 per cent or better solution of wood alcohol was used. The mixture being checked up by the use of a hydrometer. In the spring the strip of brass was taken out and calipered with a very fine instrument and could not detect any waste whatsoever with the fine micrometer nor with a small magnifying glass did the surface show pitting or corrosion.

The writer's experience has been that wood alcohol solution will not freeze as readily as same portion of denatured alcohol solution and the only objection to the wood alcohol solution is its odor when warm. I have put denatured alcohol in two cars this winter and will endeavor to ascertain if any better results will be obtained than with past experience with wood alcohol.

On five of our seven cars which I have purchased the gasoline feed or air pressure line has leaked and has been delivered in that condition especially when leaky gasoline feed pipe is a menace, and a fire on a new car would be a discouraging proposition to say the least. I think the manufacturers should take more care in making final inspections.—An Interested Reader.

CARPENTER'S ANSWER TO HERNE

Insists That Under Certain Conditions Make-and-Break Is Best

Sauk Center, Minn.—Editor Motor Age—In your issue of December 18 Donald Herne takes great pains to advocate the proposition I assumed in Motor Age in regard to make and break ignition as being better in my opinion than the high-tension. It really seems to me that he has no cause for this article, as I assumed the make-and-break was better than high-tension, if certain conditions existed. Without going into details regarding either system, I wish to state that the make-and-break is now used on one of our finest silent cars and by a company abundantly able to use the best. High-tension work is good, so is low-tension, as is proven by the fact that one of our leading makers has used the low-tension system since it first began making cars, and is still today using it.

I was surprised at Mr. Herne's position inasmuch as he poses as an expert in this line of work, but forgets that the low-tension system has not been used on a number of cars and then given up, for the fact remains that there are a large number of cars still using both systems, as the makers have found that neither is fully reliable.

I have before me an article sent me by a mechanical engineer in which is stated that he has been studying the ignition system for a number of years and has just been allowed a patent on a make-and-break spark plug which will overcome the objectional features of the present faulty plug, and that they will soon place it upon the market. He further says that he is operating this system and 2,100 sparks have been recorded in one minute in tests. Further, that it will spark in water, carbon or oil, and if this is true we are on an era of far better ignition for the motor cars.

If the present plugs are all right why do we see so many of them upon the market, each claiming best ignition? There is not a particle of doubt that it can be adopted by all makers and a most reliable and perfected form of ignition obtained. We all know the faults and failures of the present plug, also the low-tension and high-tension work. We earnestly seek not argument but facts and improvement in the motor car as now constructed and this is to be had only by experimenting along the lines indicated. That the make-and-break system is most reliable where employed there can be no doubt, and where used is silent. It is not worthy of note that the plug Mr. Herne mentions ran 3,000 miles and was still good, as I have seen one placed in the cylinder and the car never left the shop before it had to be replaced.—A. D. Carpenter.

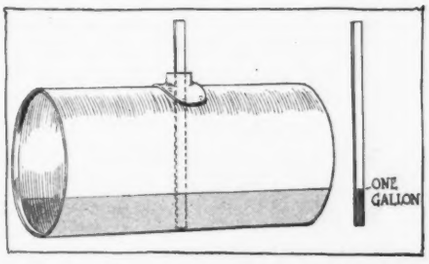


FIG. 2—MAKING AN OVAL TANK GAUGE

Known quantities of gasoline are poured into the tank and a stick inserted. The liquid level is marked after each known volume is placed into the container

Miles Per Gallon of Hudson

Cleveland, Okla.—Editor Motor Age—How far will a Hudson six-cylinder travel on 1 gallon of gasoline?

2—How long will a Hudson six last?

3—Is the new Hudson a light six?—Bert Jordan.

1—The 1914 Hudson big six will travel between 10 and 14 miles on a gallon.

2—This is hardly answerable as all depends upon the driver and the care given the car. Such a car, however, should live about 4 or 5 years.

3—The Hudson appears in large and small six models.

ETHER IN FUEL NOT RECOMMENDED

Found in Practice to Be Injurious to the Metal of the Motor

Price, Utah—Editor Motor Age—What is the proportion of ether to gasoline in order to make a good explosion such as used in racing cars? Also, what is the correct amount for passenger cars in order to make a surer fire or explosion than just carbureted gas?

2—What mixture of other liquids or fuel is good in order to produce good power and yet is safe?

3—Give me the name of a non-freezing fluid for use in the radiator of radiation cooled cars.—V. R. W.

1—A half-pint for 10 gallons of gasoline will give more power but will injure the motor. The use of ether is not recommended. Racing cars do not use any such substance, but run on gasoline only.

2—Some marketed preparations are efficient and aside from these Motor Age knows of nothing which is not injurious.

3—Anti-freeze compounds were given in Motor Age issue of November 27, page 37.

MEASURING FUEL IN OVAL TANK

How a Gauge May Be Made for a Cylindrical Container

Orangeburg, S. C.—Editor Motor Age—Is there any other method of obtaining than by higher geometry, the capacity of a certain height in a cylindrical tank; in other words, how can a gauge for any size of cylindrical tank be made, as shown for a Ford tank in Motor Age, issue December 18, page 39?—W. C. Herbert.

The capacity at various heights of a cylindrical tank may be ascertained easily by experiment. Pour the contents of a 1-gallon measure into the tank and then place a stick into the liquid as shown in Fig. 2 after the liquid has come to rest. Remove the stick and mark it where the level of liquid appears. Then pour two gallons into the tank and again insert the stick, removing it again to make another mark. Then pour three gallons, then four, etc., until the tank is filled, each time making a mark on the stick. The stick then would show the depth of the liquid when the tank contained 1, 2, 3, 4, etc., gallons. All that is necessary is to measure the distance between the various marking with a ruler to get the depth in inches and fractions of an inch.

Number of Makes in the States

Wabash, Ind.—Editor Motor Age—How many manufacturers of pleasure motor cars are there in the United States at the present time?

2—How many new companies have been started, and now manufacturing pleasure cars, during the past year?

3—How many companies manufacturing pleasure motor cars have failed and retired from the business during the past year?—A Subscriber.

1—About 165, excluding cyclecars.

2—A dozen or so.

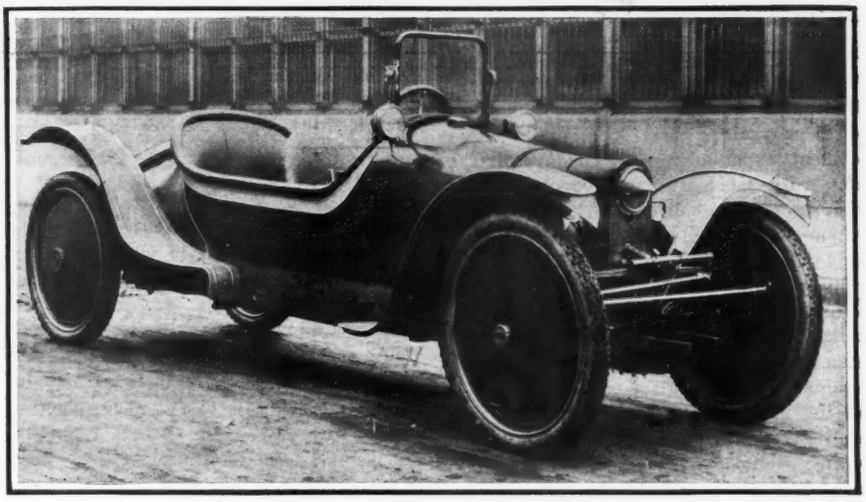
3—In the neighborhood of 14.

Cyclecar Development

Cyclecar Engineer Points Out Trends in Design

MINNEAPOLIS, Minn., Editor Motor Age—After carefully investigating the cyclecar from the standpoint of critical study some 2 years ago, I naturally watched the development and every success and failure in Europe, that the product might be useful to America, not only as directly applicable to our domestic needs here, but also to the export possibility that might be involved after carefully building up a great producing center involving facilities and protections that are more or less exclusive in their scope.

In following out this most interesting problem of developing a production to meet the requirements of a four-wheeled vehicle that could be produced for various road and climatic conditions and for so universal a use, be it for passenger or package delivery, naturally a great task was encountered. The most interesting portion of the writer's continuous study was the European's attitude from the very outset, and eventually the American's grasp of the situation as the idea of such a vehicle becoming more and more a reality in the annals of commercialism abroad. This tendency first developed in the nature of curiosity and later appeared to be a logical solution for a paved street package car as required, for instance, by the large city druggist.



THREE-QUARTER VIEW OF THE NEW ROBIE

Studying the Subject

This attitude among America's first enthusiasts was largely and of course naturally due to the general opinion at that time among manufacturers and motor engineers that vehicles of this nature could not be generally utilized in this country where the weight was under 1,000 pounds and with a motor smaller than 150 cubic inches displacement. However, as time went on and many tests and severe trials of the 500 to 600-pound cars were made, principally abroad, a different insight into this subject was gained by American students and designers. Gradually the subject became one of interest here at home as to what would serve the later public demands for a product in the cyclecar class adaptable to the requirements that now have eclipsed anything that the European designer or builder has had to cope with, due principally to the somewhat different motor vehicle conditions that already existed in America, both from a production and a service standpoint.

In the first place, my severe tests in this field by comparative fuel consumption and mechanical wear, showed that the necessity of a well-balanced motor and a positive differentiated drive to the rear wheels is more imperative and more demanding than in larger and more powerful and stable machines.

Second: The present price of complete cyclecars must be well below $400, completely equipped, aside from possibly a top of some kind.

Third: The number of speeds should be numerous on account of the service occasioned by abrupt speed changes in a smooth-running or pulling flexible motor. Hence the great opportunity for a friction drive in this particular field or class of transport.

Fourth: After transmitting of engine power immediately through transmission and differentiated at the same point to avoid any possible unbalanced strains, as surely will be occasioned if said differentiation is delayed in the propeller unit.

Fifth: After above precautions are fulfilled, the designer is in a position to avoid all non-positive drives, and there should be utilized an absolute positive but flexible drive which should be entirely protected from dirt and any change of condition under different positions or speed of the car.

Narrow Tread and Light Weight

Sixth: In the true narrow-tread and lightweight car being built and sold for uniform high-efficiency service, the load conditions should at all times insure the weight line to come over the lengthwise center line of the vehicle. This necessity demands the tandem style of seating, as then the machine always is under sidewise balanced conditions whether one or two passengers are carried, a feature which in cyclecars should once for all abolish sociable seating.

Seventh: Simple construction, so necessary in the high-grade cyclecar at a right price. One set of wheel brakes correctly installed is most desirable, and with the most suitable transmission is all that can be asked, as transmission unit can be utilized as such also.

Eighth: In the matter of steering, this must be absolute and positive, although I find that absolute irreversibility is not by any means necessary. I consider the cable wrap or the entire front axle swing very inadequate in those machines I have had the opportunity to fully test out.

Doors Should Be Fitted

Ninth: The closed side body without any doors has most certainly—and justly so—received the severest criticism, both abroad and already here in America, on account of the inability of said advocates of such a body to offer anything that would suit even a good minority of the possible users or purchasers. My European and later American experience along this line has been that so little is really saved in the correct design of a suitable body by abolishing entirely the door idea, that by exercising some ingenuity along this line this great convenience to further utility can be embodied without prohibitive, if any, cost added.

Tenth: Lastly, and by no means disregardingly, a protected and assured road clearance for our American roads is something no designer or able builder can afford to overlook, as efficiency and consistency of service should at all times be the aim for the purchaser to sustain the legitimate demand for this class. Consequently, no lower than 9 inches clearance with tires pumped up on a level floor should be tolerated in the best general use cyclecar. This means that no parts—

at any rate, those in motion, aside from the wheels and their direct elements—should come nearer to the lowest point of the tires when correctly inflated than 9 inches for the most serviceable car for city or for country use.—J. E. Pfeffer, Continental Engine Mfg. Co.

ROBIE NEW CHICAGO PRODUCT

The Robie, made in Chicago, is a distinctive tandem-seating small car with unique construction in both body and chassis. The final drive is by a single chain to a live rear axle, perhaps the only small car on the present market using this method. The motor is built in the Robie shops in Chicago and is of the two-cylinder air-cooled type with 90 degree cylinders of 3½ by 4 3/32 inches bore and stroke. The motor drives a friction transmission which is under the hood. The car has no differential, but drives through the solid axle, and is equipped with wire wheels with sheet metal sides, designed to lessen wind resistance. The Robie has a 108-inch wheelbase, 36-inch tread and sells for from $375 upward.

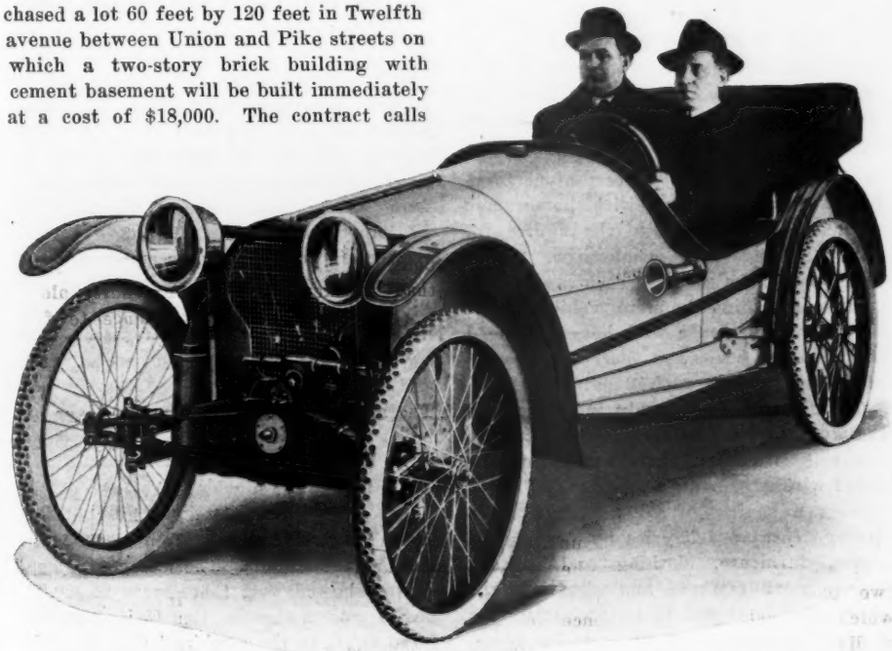
CHICAGO HAS CYCLECAR RUN

Three cyclecars, a Dayton, a Puritan and a Frederickson, participated in the first cyclecar run ever held under the auspices of the Chicago Cyclecar Club on New Year's day. The cars traveled over the Chicago-Elgin-Aurora triangle and averaged bettered than 20 miles an hour.

SEATTLE ANNOUNCES CYCLECAR

With its capital fully subscribed and its plans and negotiations completed, the American Cyclecar Co., of Seattle, Wash., announces its entry into the manufacturing field. Articles of incorporation have been filed with the secretary of state at Olympia by the new firm, which is headed by Daniel Murray, a Seattle capitalist, and George L. Grant, president of the Grant Machine Works. The firm has purchased a lot 60 feet by 120 feet in Twelfth avenue between Union and Pike streets on which a two-story brick building with cement basement will be built immediately at a cost of $18,000. The contract calls for the plant's completion on February 1.

While all the details of the American Cyclecar Co.'s product have not been disclosed, a general outline is given by Designer Grant, who also will have charge of the building and assembling departments. It will have a three-cylinder, two-cycle engine developing about 12 horsepower at 1,000 revolutions. Friction-drive to the front axle will supply the propelling power. The friction wheel is mounted on a shaft, on which end of which is a sprocket. Chains operate from this shaft to sprockets on the front axle, which is located between and beneath the first and second cylinders of the engine. The tread will be 40 inches and the wheelbase 96 inches. The car will weigh about 650 pounds with the roadster body, which will seat two passengers side by side. A commercial model also will be turned out. The manufacturers expect to put the car on the market in Seattle for $350. The cars will be equipped with 28 by 2½-inch wire wheels. The output the first year will be about 300 cars.



PIONEER CYCLECAR, MADE BY AMERICAN MFG. CO., CHICAGO

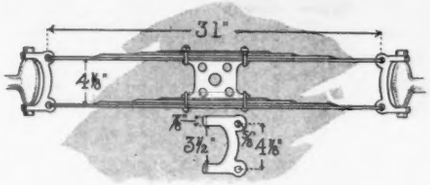
Answers to Cyclecar Inquiries

OFFERS SPRING SUSPENSION IDEA

H. L. Gray Also Wants to Know Where to Get Spindle Carriers

WASHINGTON, D. C.—Editor Motor Age—What does Motor Age think of a front suspension as indicated in accompanying sketch?

2—Where can the spindle carriers be gotten if I furnish the pattern, and what kind of metal should same be made of? Should it be a casting or a drop forging?—H. L. Gray.



IDEA FOR FRONT SUSPENSION

1—The spring suspension shown is one of the best within its range of spring action. The spring leaves should be made with clips, as shown to prevent them from sliding sideways.

2—The spindle carriers and the yoke can be obtained in steel or bronze from any good foundry provided you furnish the pattern. If making but one car bronze or cast steel will do, if manufacturing in quantities the pieces should be forged.

Power of 8-Horsepower Motor

Nashville, Tenn.—Editor Motor Age—Will an 8-horsepower four-cylinder air-cooled motor be sufficient to run a single-passenger cyclecar?

2—Which is the best type of transmission for same, the direct shaft drive with differential on rear axle, or the sliding disk with jackshaft and chain gear?

3—What would be the relative difference, as relates to power, between the direct and the disk transmission.—James H. Yeaman.

1—Yes, if cooled with good fan from the side.

2—The friction with jackshaft and chain gear will be cheapest and will give a range of speed which will enable you to better handle your motor. Do not try too wide a tread with this motor as the narrower the tread the less road resistance you will encounter. Thirty-six-inch is the usual width.

3—This depends entirely on friction, but one should be about as efficient as the other.

Springing Problem

Brooklyn, N. Y.—Editor Motor Age—During a discussion regarding cyclecars and their construction I made the statement that the problem was one of suspension as well as the ratio of the weight above and below the axles. My opponents contended it was one of entire weight and that suspension was a secondary consideration.—George Woof.

Both items count in giving correct suspension although the ratio of weight above and below the springs—not the axles—has more to do with easy riding than the springs themselves. Cyclecar springs should have the same vertical range of action that is allowed on the largest cars as they are expected to make the same speeds over the same roads. These springs should be very resilient, hence tandem seating is considered to have an advantage. Outside of the action allowed and the resiliency of the springs the amount of unsprung weight below the spring is of enormous importance and if a cyclecar can show a ratio of 1 to 6 instead of 1 to 3 as in the average big car it will be a more comfortable riding vehicle than the big car. If the springs are placed crosswise to take the place of axles the gyroscopic effect of the wheels will prevent any side rolling of the car.

The Realm of The Commercial Car

Cutting Down Transportation Costs

IT has been shown by various investigations that the cost of distribution adds a large percentage to the retail prices of all products of the farm and factory, and that transportation is an important item in the cost of distribution. Anything that will reduce the cost of moving crops to market and delivering them and manufactured articles of all kinds to the consumer will tend to keep down the retail price and reduce the cost of living.

During the 70 years that steam railroads have been operated in America, the cost of haulage by rail has been cut from 7⅓ cents per ton-mile to the present figure of 7½ mills, or to a little more than one-tenth the original cost. But there has been very little fluctuation of the average receipts per ton-mile for rail freight since 1900, as shown by the reports of the interstate commerce commission, and the price today is slightly higher than 13 years ago. So no relief is to be looked for in that direction.

Water Rates Cheaper Than Rail

Transportation by water is considerably cheaper than by rail, varying, according to such statistics as are available, from ½ mill per ton-mile on the great lakes and the ocean to 3 mills on canals from 5 to 10 feet deep.

These means of transportation essentially are long-haul and bulk methods. They have been developed to a degree that precludes hope of material further reductions. There remains the cost of moving freight from the producers to the shipping point and from the railroad freight yard and steamship pier to the factory or warehouse, thence to the wholesaler and retailer, and finally to the ultimate consumer. It is these repeated movements, each over a relatively short distance, that multiply the transportation costs.

In 1906 the department of agriculture made a careful investigation into the cost of hauling farm products to shipping points throughout the United States. The inquiry related to twenty-three principal products of farms, plantations and ranches and nearly 1,900 replies were received from correspondents. These were tabulated and analyzed. The result showed that it cost an average of a little more than 23 cents a ton for every mile that these products were hauled by horse and wagon. The average length of haul was just short of 10 miles and principally over earth roads, as at that time only a little more than 8 per cent of all the roads in the country had been improved by hard surfacing.

The only known way of reducing the cost of haulage by team is to improve the roads. Rapid progress has been made in this matter in many states within the last decade and particularly inside of the last 5 years, but whatever gains have been made in this way probably have been offset by the increased cost of using horses, because of the higher purchase prices of horses and the increased cost of hay and grain, labor and other items. Consequently, no relief has come from this quarter.

Apparently the only remaining hope for actual and substantial reduction of transportation cost lies in the commercial motor vehicle. No official and general investigation ever has been made into the cost of hauling and delivering by motor truck and delivery wagon, but large users of these vehicles have demonstrated to their satisfaction that they are much more economical than horses. Among the manufacturers of these machines it has been asserted generally that they effect a saving of from one-third to one-half. These claims are fairly substantiated by a tabulation that has just been made by the secretary of the commercial vehicle committee of the National Automobile Chamber of Commerce.

Detailed reports of the operation of motor trucks and delivery wagons in the service of thirty prominent companies, engaged in various lines of business, in fifteen different cities, were searched for reliable records of operating costs. In many cases these cost records were itemized and covered periods of a year or more, sometimes embracing the figures for fleets of from five to fifteen or more vehicles. These data were analyzed and tabulated, so as to show the cost of haulage and delivery per day, per mile, per-ton-mile and per package.

Comparisons Made

Wherever possible, the cost of performing the same service with horses and wagons was set opposite the figures for motor haulage for comparison. These horse costs were given in each case by the companies owning the motor vehicles, from their own experience with horses engaged in the same service, so the comparison is in the highest degree fair and reliable.

The result of this study indicates that the average cost hauling in the city by motor is 11¼ cents per ton-mile, as compared with 17¾ cents by horse. This represents a saving of 36 per cent. The average cost of deliveries by department stores, furniture, clothing and grocery stores, meat markets and electric light companies, is shown to be approximately 8 cents by motor and 16 cents by horse, representing a saving of more than 50 per cent by the former method. The analysis shows that the average cost of operating motor trucks and delivery wagons, embracing all sizes of both gasoline and electric machines, is $10.97 a day. This covers all items of operation and maintenance, such as driver, garage, interest and depreciation. The average cost of doing equivalent work with horses is $16.75 a day, which represents the expense of from two to three wagons, with drivers. Here is a saving of more than 34 per cent.

On this showing it is evident that the motor vehicle offers abundant opportunity of reducing transportation costs in the immediate future, and that the reduction will be very substantial—from one-third to one-half.

Motor Truck Benefits

What the general use of these vehicles will mean to a community is indicated by some figures submitted by the head of a Chicago cartage company to the Chicago Association of Commerce. This report states that more than 250,000 tons of freight are hauled through the streets of Chicago daily by team and motor truck and that this represents an annual business of more than $60,000,000, or about $25 a year for every inhabitant. There are more than 50,000 horse-drawn wagons and trucks in use in Chicago and about 4,000 motor trucks and wagons. When the 50,000 are converted into 20,000 motor vehicles, the direct saving in haulage will amount to from $20,000,000 to $30,000,000, or $8.25 to $12 a year for each inhabitant, or about $35 to $50 a year for each family.

Large as this saving is, it really will be much greater, because the reduction of traffic congestion in the streets and at freight depots, resulting from the elimination of more than half of the vehicles, will so expedite haulage that it can be done still cheaper by motor wagons than under present conditions. There also will be important savings resulting from the real estate now devoted to stabling horses and wagons and the storage of hay and grain that can be devoted to better purposes and from reduction of street-cleaning costs and sickness and mortality resulting from street filth and the fly pest. The aggregate of these savings never has been, and perhaps never can be, calculated.

Another way in which the cost of living is going to be cut down by the revolution in road transportation methods relates to farm lands. The last government census showed that there were 24,000,000 horses and mules in the United States. Land equal to the combined area of Ohio, Indiana, Illinois and Iowa was required to

raise the hay, grain and grass to feed these animals, it is estimated, yet the horses and mules do not produce any human food. In other words, 25 per cent of the total value of all agricultural products goes to feed animals to furnish transportation and power. Motor vehicles and traction engines, which consume gasoline, kerosene, coal and other fuels derived from inedible materials or from alcohol distilled from waste vegetable matter, can do most of this work and release this tremendous acreage of productive land for the raising of human food. The effect that this should have on the cost of foodstuffs is obvious.

Army Slow in Gathering Motor Data

AN army officer who declines to have his name used says a comparison of the cost of hauling by wagon and by motor truck is no longer a live question. He is quoted as saying:

"As I understand, the war department about 2 years ago adopted the policy of replacing mules and wagons at depots with motor trucks, being satisfied by actual experiment that the latter were more economical; the only thing being left to determine in that case was which type of truck would be most economical. That policy definitely determined, the department started out to find if the motor vehicle could be depended upon to replace the mule in the field trains of our army.

"A number of tests were conducted, concluding with that in connection with the march of the provisional regiment in Wisconsin. In the beginning the observers with that regiment had no faith in the truck for field work. At the conclusion of the march, however, they were all enthusiastic over the possibilities of the motor truck as a substitute for the mule in the field trains. Right there the matter seems to have died. The report of the observers never has been made public, nor is it accessible so far as known.

"It seems that all idea of developing a truck for field trains has been abandoned —this after going to the expense of having all best types of machines tried out and all the leading factories inspected by an officer. Those officers who have witnessed the performance of the machines believe that a suitably constructed truck is entirely feasible for field work, while those who have not seen and have no knowledge of the efficiency of the machines in the field adhere to the idea that the mule and wagon is our only dependence.

"We must educate the latter class. Then it will be possible to advance the status of our field transportation a little beyond that which obtained during the civil war. No other article of equipment remains the same as used in that war except the transportation."

RAILROADS FEEL COMPETITION

A Connecticut railroad official states that motor trucks have had a deleterious effect upon the road's freight business. This has become more marked during the past year, especially in those cases where people move from one town to another and where the distance is great. This year there have been numerous cases of this sort. The direct haul of the motor truck against a haul at each end, not to mention transit in the freight cars, has been generally considered.

There are several expressmen in Hartford who have done a remarkably good business during the past year in hauling from one town to another. In one case the owner has had exceptionally good luck in hauling in each direction. From Hartford to New York a charge of $125 is made for delivery of a load of household goods. About the same is charged from Hartford to Boston. With the expressmen who specialize on long hauls a flat charge of $1 a mile is made.

NEW G. M. C. PRICES

The General Motors Truck Co., of Detroit, announces a new schedule of prices, which took effect January 1. This schedule means a large saving to truck buyers, as heavy trucks, formerly selling for $4,500, are now listed at about $3,000, while the lighter capacity vehicle at $3,250 now is $2,250.

In explaining this move W. L. Day, vice-president and general manager of the company, says that the amount of free service which was necessary for the truck manufacturers to furnish in the early days now is a thing of the past, due to the standardization of truck design and manufacture. While the trucks were in the experimental stages it was necessary to cover the service overhead in the price of the car. The buyers are now being given the advantage of the economies resulting from improved methods of construction. Although it will be the policy of the company to discontinue a service that puts a premium on the reckless operation of trucks, there will be no curtailing of the guarantees of quality and replacement of defective parts which have always been issued by the company.

COST OF HAULAGE AND DELIVERY BY MOTOR AND HORSE-DRAWN WAGONS

Compiled from Records of Twenty-eight Prominent Users of Motor Trucks and Wagons by National Automobile Chamber of Commerce.

Operating Company	Location	Business	No. of Vehicles	Kind	Basis of Data	Per Day Motor	Per Day Horse	Per Mile Motor Cents	Per Mile Horse Cents	Per Ton-Mile Motor Cents	Per Ton-Mile Horse Cents	Per Package Motor Cents	Per Package Horse Cents
Abraham & Straus	Brooklyn, N. Y.	Dept. Store	24		1 yr. record	.....	.....	11.68	.....	.....	.....	3.67	.....
A. Starr Best	Chicago	Clothing	1	Gas		$ 7.25	.....	.....	.....	.....	.....	10.33	.....
Boston Store, The	Chicago	Dept. Store	1	Elec.		.....	.....	.....	.....	.....	.....	5.6	.....
Bridgep't Hydraul. Co.	Bridgep't, Ct.	Contractors	2	Gas	9½ mos. record	.....	.....	25.3	.....	9.85	16.07	.....	.....
Fair, The	Chicago	Dept. Store	52		1½ ton tr'k 1 yr. rec.	9.77	.....	.....	.....	.....	.....	.....	.....
General Omnibus Co.	London, Eng.	Passengers	2500	Gas	1st 3 mos. 1913	13.22	.....	12.84	.....	.....	.....	*2.13 pr pass	
Gimbel Bros.	New York city	Dept. Store	14	Elec.	6 mos. record	.....	.....	10.8	.....	.....	.....	.....	.....
Gimbel Bros.	New York city	Dept. Store	18	Elec.	6 mos. record	.....	.....	7.52	.....	.....	.....	.....	.....
Gimbel Bros.	New York city	Dept. Store	1	Gas	6 mos. record	.....	.....	9.48	.....	.....	.....	.....	.....
Gimbel Bros.	New York city	Dept. Store	1	Gas	1 yr. record	.....	.....	23.12	.....	.....	.....	.....	.....
Gimbel Bros.	New York city	Dept. Store	1	Gas	1 yr. record	.....	.....	24.51	.....	.....	.....	.....	.....
Golden Rule Store	St. Paul, Minn.	Dept. Store	3	Gas		.....	.....	.....	.....	.....	.....	3.0	6.0
H. Hanlein & Son	New York city	Cut Stone	2	Gas	Garage & tax. omit.	14.29	.....	.....	.....	15.3	.....	.....	.....
Igo Express Co.	St. Paul, Minn.	Express	5	Gas	Ry.frt.rate16ct'n-mile	12.00	.....	.....	.....	6.0	10.0	.....	.....
Indiana Market	Chicago	Meats	1	Gas		7.17	$13.26	.....	.....	.....	.....	.....	.....
Michaud Bros.	St. Paul, Minn.	Groceries	6	Gas		.....	.....	.....	.....	.....	.....	2.5	4.5
McMillan Co., J. T.	St. Paul, Minn.	Pork Pckrs	1	Gas		8.32	13.27	.....	.....	.....	.....	.....	.....
Nawn Co., Hugh	Boston, Mass.	Contractors	6	Gas	5 mos. record	17.20	.....	37.6	.....	.....	.....	.....	.....
Perkins Co., H. J.	Springf'd,Mass.	Produce	3	Gas	1 yr. record	11.95	16.80	.....	.....	.....	.....	.....	.....
Rothschild Co., Maur.	Chicago	Dept. Store	6	Gas		16.20	33.00	.....	.....	.....	.....	8.0	11.0
Spaulding & Spauld'g	Buffalo, N. Y.	Coal	17	Gas	8 mos. rec. 1 truck	9.40	.....	27.5	.....	11.3	.....	.....	.....
Springfield Breweries	Springf'd,Mass.		1	Gas	11½ mos. record	.....	.....	.....	.....	.....	.....	8.5	20.0
Standard Oil Co.	Nashv'le, Tenn.	Oil	1	Gas	2 yr. experience	.....	.....	.....	.....	32.6	.....	.....	.....
Standard Oil Co.	Memphis, Tenn.	Oil	1	Gas	2 yr. experience	.....	.....	.....	.....	7.62	.....	.....	.....
Standard Oil Co.	Memphis, Tenn.	Oil	1	Gas	2 yr. experience	.....	.....	.....	.....	7.94	.....	.....	.....
Stix, Baer & Fuller	St. Louis, Mo.	Furniture	10			.....	.....	.....	.....	.....	.....	24.33	35.0
Stix, Baer & Fuller	St. Louis, Mo.	Bulky G'ds	10			.....	.....	.....	.....	.....	.....	10.5	14.75
Transit House Stores	Chicago	Meats	2	Gas		4.19	7.42	.....	.....	.....	.....	.....	.....
Troy Wagon Works	Troy, O.		1	Gas	16 tests	.....	.....	.....	.....	14.9	27.7	.....	.....
Unit. Dressed B'f Co.	New York city	Meats	29	Elec.	7 yr. experience	.....	.....	.....	.....	7.89	17.28	.....	.....
Unit. Dressed B'f Co.	New York city	Meats	..	Gas	7 yr. experience	.....	.....	.....	.....	8.04	.....	.....	.....
Wouter's Laundry	Chicago	Laundry	5	Gas		.....	.....	11.0	.....	.....	.....	2.66	.....
Mill Corporation	.....	Haul'g Coal	..	Elec.		12.00	.....	41.6	.....	8.3	.....	.....	.....
Retail Dealer	Eastern city	Coal	3	Elec.	1 mo. record	10.34	.....	.....	.....	7.5	.....	.....	.....
Retail Dealer	Suburb	Coal	..	Elec.		12.64	.....	.....	.....	13.3	.....	.....	.....
Wholesale Dealer	Large city	Coal	..	Elec.		.....	.....	.....	.....	6.7	.....	.....	.....
						Av.$11.06	$16.75	20.24	.....	11.23	17.76	7.90	15.04

*Omitted from average.

From the Four Winds

MICHIGAN Farmers Ardent Motorists—According to the records of Secretary of State Martindale, more Michigan farmers owned motor cars in 1913 than ever before. Owners in the cities registered 34,268 machines, and 19,060 licenses were issued to those living in townships and villages.

"Move on" Order in Frisco—San Francisco motorists have lost their fight for the right to stand for an unlimited period of time on the principal streets in the downtown retail district, and in the future merchants, professional men and shoppers who are accustomed to drive their own cars, must limit their business to 40 minutes and then move their cars to some other part of the street, where they may again have a 40-minute respite.

Hunt Wolves in Motor Cars—Motor car owners of Gretna, Man., have discovered a new sport. There are quite a number of wolves in the vicinity and a hunt club has been formed, the members of which are car owners who use their machines for the purpose of hunting the wolves. Members start out with their cars in the early morning and tour until a wolf is started. It is then a neck and neck race across the prairie to see who will claim the honor of shooting the wolf.

Hoosiers Plan Boulevard Road—There is a movement on foot for building a paved boulevard a distance of 40 miles to connect Indianapolis and Anderson. It is proposed to pave the boulevard with brick and make it one of the finest highways in the United States. It is regarded as likely that the first section to be built will be between Anderson and Pendleton, 8 miles. Farmers along this section are getting behind the proposition with considerable vigor. Efforts will be made to apply on the cost of this section Madison county's share of the state motor license revenue.

Motor Stage Line Over Desert—Over the trail made famous in the story of Barbara Worth—the 120-mile stretch of desert and mountain between San Diego and the Imperial Valley—the bark of the motor car is heard with incessant regularity each day, according to H. B. Webb, traffic manager for the company which has installed a motor stage line between these two points. The company has been using two six-passenger Hupmobiles on this run for the past month in addition to a Packard, Locomobile and three Stanley steam cars. The 120-mile trip is made on a 7-hour schedule and 25 passengers daily is the season's average, in addition to great quantities of small freight.

Wage Anti-Accident Campaign—Through the efforts of the Automobile Club of New Haven and Superintendent Beede of the public schools, a plan has been inaugurated to lessen the dangers to school children from vehicle travel of every sort. Thousands of cards have been printed on which are a few simple rules to teach children how to be careful. More cards have been hung in the schoolrooms designed to impress upon the pupils' minds the danger of rushing into the streets without watching traffic. Superintendent Beede has instructed the teachers to deliver talks to the children from time to time on the dangers so as to firmly impress upon the youngsters what is certain to result from carelessness. In connection with the campaign it developed that the city authorities had not complied with the law passed by the legislature this year that warning signs should be erected within 500 feet of every schoolhouse cautioning drivers of vehicles to be careful when approaching the buildings. The Automobile Club of New Haven is going to take the matter up with the state authorities to see that all cities and towns comply with the law.

Los Angeles in Safety Campaign—"Respect," "Caution," "Quiet," "Care,"—these signs in glaring red letters will appear throughout Los Angeles shortly in front of churches, schools, hospitals and fire stations, as a part of the campaign of the Automobile Club of Southern California to reduce motor car accidents.

Declare War on Motor Smugglers—The United States customs officials at El Paso, Tex., have determined to stop the large amount of petty smuggling from the Mexican side which has been carried on by motorists. Collector Z. L. Cobb states that car drivers and owners who are caught bringing dutiable goods from Juarez are liable to lose their machines. The collector has already taken up a case with the district attorney where an attempt was made to smuggle across some Mexican drawn work from Juarez in a machine with a view of seizing the car.

Bar Sirens on Private Cars—The board of public safety, Fort Wayne, Ind., has ordered that the use of siren horns in that city shall be limited to motor fire apparatus owned by the city. There has been some confusion in the past, because both private motor cars and fire apparatus have used the horns, with the result that pedestrians paid little attention to the horns on the motor apparatus.

Wolverton Automobile Club Expands—The Wolverine Automobile Club of Detroit has leased the floor below its present quarters and will soon occupy two entire floors. Within a few days the billiard and pool room and officers' and directors' room will be moved into the new space and the old club rooms will be remodeled into a large lounging, reading and writing room, with card rooms and cafe adjoining.

Improving the Camino Real—The work of graveling and rolling the Camino Real between Las Cruces, N. M., and the Texas state line, a distance of 25 miles, is being rapidly carried on by the Dona Ana county road board. There are more than 400 teams engaged in the construction of the county's new system of gravel highways, affording a network of excellent motor roads. Large gangs are working in every part of the county. The finished roads are said to be a model of highway building, low expense considered. They are hard, smooth, well-shaped, and promise to be permanently satisfactory. The roads have been built with a gravel surface 8 inches deep, which it is believed will insure a permanent highway for years.

Getting Fuel from Sawdust—Unofficial advices from Madison, Wis., state that the forest products laboratory of the bureau of forestry, U. S. department of agriculture, at Madison, is completing exhaustive tests and experimentation in the direction of obtaining a suitable fuel for internal combustion engines out of waste forest products, such as sawdust and slabs. While it has been long established as a fact that alcohol can be obtained from sawdust, the laboratory is carrying the process much further and is said to have succeeded in perfecting stills which produce a fuel not requiring further treatment to make it suitable for the gasoline motor. Officials at the laboratory are reticent and refuse to divulge any information at this time concerning the work in this direction. It is admitted, however, that tests are going on.

State Aid Law Upheld—The Wisconsin state aid for highways law has been declared constitutional by Judge Goodland in the circuit court at Appleton, in the case of the town of Grand Chute, which refused to make the appropriations demanded by freeholders. The law provides that individuals may raise moneys for permanent improvement of highways within any township, the town board being then obliged to make a similar appropriation, which draws an appropriation of a like amount from the county. The state aid fund then appropriates a sum equal to one-third of the total appropriation to the whole. The town of Grand Chute will appeal the case to the state supreme court for the first test in the highest state tribunal of the law which has been in effect 2 years and resulted in a total expenditure of more than $5,000,000 thus far.

SHOWS, CONVENTIONS, ETC.

January 2-10—Importers' Automobile Salon, Hotel Astor, New York.
January 3-10—New York show, Grand Central palace.
January 5-10—Show, Los Angeles, Cal.
January 5-10—Show at Los Angeles, Cal.
January 10-16—Milwaukee, Wis., show.
January 10-17—Philadelphia show.
January 10-17—Show, Cleveland, O.
January 10-21—Show, Brussels, Belgium.
January 12-17—Show, Bridgeport, Conn.
January 17-24—Show, Detroit, Mich.
January 19-24—Show, Washington, D. C.
January 20-24—Show, Baltimore, Md.
January 24-February 7—Show, Montreal Can.
January 24-31—Rochester, N. Y., show.
January 24-31—Chicago show.
January 26-31—Scranton, Pa., show.
January 31-February 7—Minneapolis show.
February 2-7—Show, Troy, N. Y.
February 3-7—Show, Kalamazoo, Mich.
February 4-7—Show, St. Joseph, Mo.
February 9-14—Buffalo truck show.
February 9-14—Show, Grand Rapids, Mich.
February 11-14—Show, Louisville, Ky.
February 11-14—Show, Geneva, N. Y.
February 16-22—Kansas City show.
February 16-21—Show, Toronto, Can.
February 18-21—Bloomington, Ill., show.
February 21-28—Newark, N. J., show.
February 22-March 5—Cincinnati, O., show.
February 23-28—Omaha show.
March 2-4—Cincinnati commercial car show.
March 3-7—Show, Ft. Dodge, Ia.
March 4-7—Show, Tiffin, O.
March 7-14—Boston passenger car show.
March 9-14—Show at Des Moines, Ia.
March 17-21—Boston truck show.
February 21-28—Cincinnati passenger car show.

CONTESTS

February 21—Vanderbilt cup race, Santa Monica, Cal.
February 23—American grand prix, Santa Monica, Cal.
May 24-25—Targa Florio race.
May 30—Indianapolis 500-mile race.
June 9-11—Isle of Man road races, Great Britain.
July 3-4—Road races, Tacoma, Wash.
July 4—French grand prix, Lyons.
July 25-26—Belgium grand prix road races.
August 28-29—Road races, Elgin, Ill.
September 9—Road race, Corona beach, Cal.
September 9—Italian grand prix.
November—El Paso-Phoenix road race.

Among the Makers and Dealers

OPENS Pacific Coast Branch — The Cox Brass Mfg. Co., of Albany, N. Y., has recently established a branch house in San Francisco, Cal., at 1216 Van Ness avenue. It is in charge of Charles M. Weaver.

Cass Company May Reorganize—It is said that the Cass Motor Truck Co. of Port Huron, Mich., is making plans for a reorganization, and that A. W. Frantz, general manager, has written all the stockholders pointing out the advantages of such a move.

Petry Adds to Accessory Line—The N. A. Petry Co., Inc., of Philadelphia, has added the following accessories to its sales line: Baldwin Chain and Mfg. Co.'s transmission chains and sprockets, the American Piston Ring Co.'s piston rings and B and R shock absorbers. It will be sole distributor of these products in eastern territory.

Invents New Steel Wheel—Thomas Sharp of Ludlow, Ky., is the inventor of a steel wheel for motor cars which is claimed to be superior to other steel wheels on the market. It is to be known as the Eureka resilient steel wheel and will be manufactured in Hamilton, O., by a company soon to be organized.

Exhibit Blue Ribbons at Show—The Ward Leonard Electric Co., Bronxville, N. Y., maker of the Ward Leonard electric lighting and starting systems, is exhibiting at the New York motor car show several blue ribbons and medals won back in 1899 and 1900 by now extinct machines equipped with various types of Ward Leonard controllers.

M. and A. M. Membership Now 265—The following concerns have been elected to membership in the Motor and Accessory Manufacturers: Dunlop Wire Wheel Corp, New York, N. Y.; Grant-Lees Gear Co., Cleveland, O.; Sulzberger & Sons Co., Chicago, Ill.; American Gear and Mfg. Co., Jackson, Mich. These additions make a record membership of 265.

Traction Plow Company Formed—A hundred thousand dollar corporation, made up of leading Detroit capitalists, has started building traction plows under the name of the Steelking Motor Co. The incorporators are Edwin S. George, Packard distributor, and Standford W. Carpo. The stockholders include the following prominent Detroit business men: Jerome Remick, E. D. Stair, W. T. Barbour, A. A. Shantz, J. F. Nagel and others.

Takes Over New Locking Device—H. W. Johns Manville Co. has taken over the Sparkno lock for motor cars which renders inoperative the battery and magneto ignition systems by breaking the electric circuit. Tampering with the car when the lock is on rings a bell until the owner comes to stop it. The device works by combination, no key being used, and has two sets of combinations, one for the battery and one for the magneto ignition. The company also has taken over the G-V muffler cutout made by the G. Piel Co.

Alderman Patents New Transmission—Nathan H. Hall, member of the lower house of the municipal assembly from the twenty-third ward, St. Louis, Mo., has been notified by the patent office at Washington that his model for a new transmission and steering gear for motor-driven vehicles has been patented. According to Hall, the device has undergone many tests and has been approved by Charles Swingley, St. Louis fire chief, who believes the device is adapted peculiarly to fire fighting apparatus driven by motor. The steering gear arrangement permits the use of the "cut under" front bodies on vehicles. The "fifth" wheel is used in the adaption of Hall's invention.

Oshkosh Agency Is Bankrupt—The Oshkosh Motor Car Co., Oshkosh, Wis., has filed a voluntary petition in bankruptcy. Its schedules show assets of $14,082.11 and liabilities of $33,821.80, of which amount $31,834.62 is unsecured. The largest individual creditor is the Cadillac Motor Car Co., Detroit, Mich., to which the concern is indebted in the sum of $2,022.28. Other claims listed are: Michelin Tire Co., Milltown, N. J., $792.31; Republic Rubber Co., Chicago, $948.51; Dayton Engineering Laboratories Co., Dayton, O., $119.39. The company operated a garage and agency at Oshkosh for several years.

Disco Sale January 14—At the creditors' meeting of the Disco Co. held December 29th, the Security Trust Co. of Detroit appointed a trustee in bankruptcy and will sell the remaining property at public sale on January 14 at 10 o'clock. The creditors also have the privilege of selling all the goods at private sale for 75 per cent of its appraised value. The Ross and Young Machine Co. of Detroit has purchased considerable of the stock of material in order to continue to equip with this type of starter the Paige motors which they build. Mr. Ross is not prepared at present to state whether his company will manufacture these starters for purposes other than to complete the Paige contract.

Timken Building New Addition—In spite of rumors of temporary slack times in the motor car industry the Timken Roller Bearing Co. has found it necessary to put some more of its acres at Canton, O., under roof. The shell of a new building, 120 by 140 feet, has been built of lumber and is being rapidly filled with concrete in which steel rods are buried for reinforcement. The new structure is one-story high with a ventilator above its center for light and ventilation. Over this ventilator extend the heavily insulated wires that carry the "juice" from the transformer station to electric motors in various parts of the plant.

More Power for Ford Plant—The Ford Motor Co. has let contracts for a big addition to its power equipment, which will increase the 15,000 horsepower now developed by the big gas engines by 28,000 horsepower. The new engines will be a realization of one of Henry Ford's fondest dreams for all the energy developed by the combustion of the fuel gas will be converted into useful power. The new engines are of an entirely new design.

Recent Incorporations

Amsterdam, N. Y.—Merriam Motor Co., capital stock, $15,000; incorporators, W. J. Merriam, J. Bartholomew, F. S. Mosher.

Appleton, Wis.—Frint Motor Car Co., capital stock, $5,000; to deal in motor cars and accessories; incorporators, L. D. Frint, H. F. Heckert, S. C. Shannon.

Atlantic City, N. J.—Peoples Omnibus Co., capital stock, $500,000; to operate omnibuses; incorporators, N. G. Holmes, T. H. Smith, R. Harcourt.

Augusta, Me.—Arrow Cyclecar Co., capital stock, $500,000; to manufacture motor cars; incorporators, R. S. Buzell, L. J. Coleman.

Brooklyn, N. Y.—Oakland Garage Corp., capital stock, $1,000; incorporators, H. C. Schaeffer, E. M. Schaefer, C. Schaefer.

Buffalo, N. Y.—Leitze, Inc., capital stock, $10,000; to manufacture motor vehicles; incorporators, E. Leitze, E. P. Leitze, C. A. Cairns.

Buffalo, N. Y.—Barnard Michael Tire Co., capital stock, $10,000; incorporators, R. S. Barnard, I. Michael, S. M. Michael.

Cairo, Mo.—Cairo Auto Sales Co., capital stock, $2500; incorporators, J. P. Glynn, J. J. Glynn, A. D. Teer.

Chicago—Klingelsmith Electric Truck Co., capital stock, $350,000; to manufacture and deal in electrical vehicles; incorporators, J. M. Klingelsmith, M. F. Cure, E. E. Tiley.

Chicago—Stegeman Motor Truck Co., capital stock, $10,000; incorporators, D. G. Burkland, R. C. Flodin, E. E. Burkland.

Chicago—Uno-Lamp Co., capital stock, $2500; to manufacture lamps; incorporators, O. R. Barnett, P. H. Truman, H. M. Gillespie.

Cincinnati, O.—Neil-Smith Electric Tool Co., capital stock, $30,000; to manufacture and deal in electric tools; incorporators, J. W. Neil, E. F. Smith, R. K. LeBlond, C. M. Bigger, J. G. Neil.

Cleveland, O.—Grant Distributing Co., capital stock, $25,000; incorporators, E. C. Anderson, G. W. Anderson, E. H. Anderson, F. E. Stuyvesant, O. F. Coville.

Cleveland, O.—Noble Refining Co., capital stock, $25,000; to refine oils, and manufacture lubricants; incorporators, L. A. Ritzman, C. L. Ficker, Frank Korella, L. E. Long, A. L. Ritzman.

Dallas, Tex.—Pullman Tire Co., capital stock, $5000; incorporators, R. S. Kayser, S. Zeve, S. W. Wexler.

Dallas, Tex.—United Auto Supply Co., capital stock, $5000; incorporators, R. S. Kayser, S. Zeve, S. W. Wexler.

Dover, Del.—Corsair Motor Co., capital stock, $25,000; to manufacture and deal in motor trucks.

Eddyville, N. Y.—Laidlaw Co., capital stock, $300,000; incorporators, C. E. Easton, L. H. Reed, C. L. Hepburn.

Groton, Conn.—Mystic Motor Co.; incorporators, H. P. Matthews, H. Hoxie, J. D. Miller.

Kansas City, Mo.—National Motor Car Co., capital stock, $13,000; incorporators, H. F. Sundin, H. E. Hunt, L. H. Gaskell.

Lansing, Mich.—Steel King Motor Car Co., capital stock, $100,000; incorporators, E. S. George, S. T. Craple.

McKeesport, Pa.—Ninth Avenue Garage Co., capital stock, $15,000; incorporators, G. Baehr, W. H. Baehr, G. L. Baehr, Jr.

Montreal, Can.—Canadian Michelin Tire Co., Ltd., capital stock, $40,000.

New Britain, Conn.—Hine-Morrin & Zimmerman Co., capital stock, $10,000; motor car business; incorporators, A. C. Hine, F. Zimmerman, William J. Morrin.

New York—Convent Garden Garage, capital stock, $40,000; general garage business; incorporators, W. E. Thompson, A. P. Coburn, C. A. Forshew.

New York—Wadsworth Auto Repair Shop, capital stock, $2,000; incorporators, J. D. Flynn, G. Beverly, J. Farrell.

New York—Briscoe Motor Co., capital stock, $500,000; incorporators, L. E. Latter, W. J. Maloney, H. Latter.

New York—L. A. Van Patten, capital stock, $60,000; incorporators, A. G. Thaanum, F. Disch, R. Goldman.

New York—DeVere & Strang, capital stock, $10,000; to manufacture and deal in machine supplies; incorporators, F. M. DeVere, E. L. DeVere, K. P. Strang, F. M. Strang.

New York—Wagner Sales Corp., capital stock, $5,000; to deal in starters and motor car devices; incorporators, M. Morris, J. C. Eichenbaum, A. F. Wagner.

New York—McGraw Tire & Rubber Co., capital stock, $1000; incorporators, R. F. Hobron, W. L. Levy, M. Davidson.

New York—Ajax Auto Service Co., capital stock, $5000; incorporators, A. G. McKeever, J. J. Bradley, J. P. Shinnick.

New York—Delehanty Tire Corp., capital stock, $125,000; incorporators, W. E. Delehanty, N. M. Cooke, J. V. Reddy.

New York—Bergman Brothers, capital stock, $2000; incorporators, H. Weinstein, M. Bergman, T. Bergman.

Piqua, O.—Meteor Motor Car Co., capital stock, $50,000; to manufacture and deal in motor cars and parts; incorporators; W. K. Boal, C. W. Magee, J. T. Nielson, S. M. Arni.

Port Richmond, N. Y.—Columbian Auto & Motor Car Co., capital stock, $5000; incorporators, J. A. Wisely, F. F. Leman, E. T. Shortt.

Poughkeepsie, N. Y.—Horace Sague & Son, capital stock, $35,000; incorporators, H. Sague, J. E. Sague, C. Sague, J. K. Sague.

Quincy, Mass.—Broadway Auto Sales Co., capital stock, $2500; to sell motor cars; incorporators, A. Thompson, J. G. Stuart, J. G. Clough.

Racine, Wis.—Shephard Plating Works, capital stock, $5000; general plating and metal business; incorporators, W. H. Shepard, P. Ruetz, F. Thompson.

St. Louis, Mo.—Trenton Motor Car Co., capital stock, $10,000; incorporators, J. L. Nugent, A. F. Becker and others.

Waco, Tex.—United Auto Supply Co., capital stock, $5,000; incorporators, R. S. Keyser, S. Zeve, S. W. Wexler.

Wilmington, Del.—International Automobile Owners' Protective Association, capital stock, $500,000; incorporators, H. E. Latter, W. J. Maloney, O. J. Reichard.

Worcester, Mass.—Worcester Tire Fabric Co., capital stock, $50,000; incorporators, D. B. Roberts, A. Bieber, F. H. Bieber, T. F. O'Loughlin.

Recent Agencies Appointed by Motor Car Manufacturers

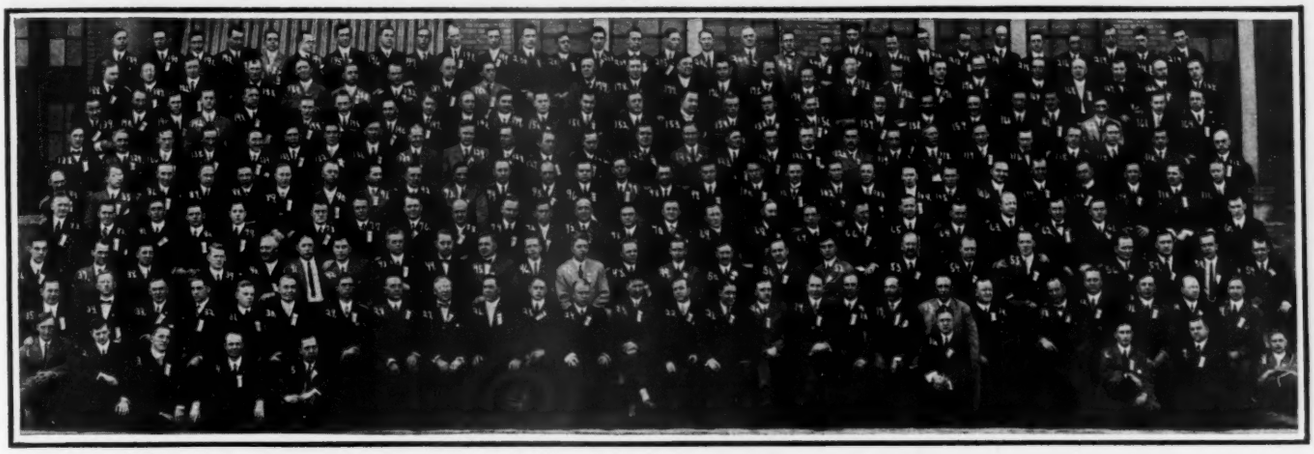
PASSENGER CARS

Town	Agent	Make
Amsterdam, N. Y.	W. H. Bell	Jeffery
Ashland, Ala.	W. A. Kitchens	Jeffery
Atkinson, Neb.	C. E. Havens	Oakland
Aurelia, Ia.	Johnson Brothers	Maxwell
Bancroft, Neb.	Alvin Browning	Oakland
Beatrice, Neb.	G. O. Rains & Co	Oakland
Bellevue, Mich.	Legge & Simons	Maxwell
Beloit, Kans.	Edward James	Jeffery
Beresford, S. D.	P. A. Rasmussen & Co	Maxwell
Boston, Mass.	Frank L. Roberts Co	Velie
Boswell, Pa.	Boswell Auto Co	Oakland
Bridgeport, Conn.	Case Motor Co	Maxwell
Champaign, Ill.	Otto O. Harris	Maxwell
Charlotte, Mich.	J. W. McCormack	Oakland
Centerburg, O.	E. E. McGuire	Maxwell
Central City, Neb.	Central City Implement Co	Oakland
Clarksville, O.	Clarksville Motor Car Co	Oakland
Coleridge, Neb.	H. V. Coonrod	Oakland
Columbia City, Ind.	F. F. Morsches	Jeffery
Crawford, Neb.	Scott Auto Co	Oakland
Columbus, O.	W. W. Muzzey	Abbott-Detroit
Dannebrog, Neb.	Oscar Carlson	Oakland
Detroit, Mich.	W. H. Weber	Jeffery
Dixon, Ill.	J. E. Miller	Maxwell
East Lynn, Ill.	J. P. McCord	Jeffery
Eau Claire, Mich.	Eau Claire Garage	Oakland
Elmwood, Wis.	Elmwood Auto Co	Maxwell
Fairfax, S. D.	Tabor Motor Car Co.	Oakland
Earlville, Ia.	P. L. Cloud	Jeffery
Ft. Scott, Kans.	Ft. Scott Grain & Imp. Co	Jeffery
Frankfort, N. Y.	H. M. Smith & Son	Oakland
Fresno, Cal.	Evans-Cobb Co.	Hudson
Fillmore, Cal.	Opsahl Brothers	Oakland
Goodland, Ind.	Oakland Sales Co	Oakland
Gooding, Ida.	Furcht Auto Co	Maxwell
Georgetown, Tex.	Towns Brothers	Oakland
Glen Falls, N. Y.	Glens Falls Auto Co	Jeffery
Gray, Ia.	King & Shaw	Oakland
Greenleaf, Kans.	Wm. Kennington	Jeffery
Hartington, Neb.	Hans J. Sorenson	Oakland
Harvard, Neb.	Schwenk & Bieck	Oakland
Hatboro, Pa.	Charles H. Yerkes	Maxwell
Havana, N. D.	J. H. Anderson	Maxwell
Henderson, Tex.	Crow Brothers	Franklin
Hillsdale, Mich.	Pinkham & Wright	Jeffery
Humphrey, Neb.	H. J. Brening	Oakland
Inman, Neb.	Inman Imp. & Hardware Co	Oakland
Ishpeming, Mich.	J. C. Forell	Oakland
Kenton, O.	Littleton & Critchfield	Lambert
Kenton, O.	Littleton & Critchfield	Ford
Kingsley, Ia.	O. S. Pixler	Maxwell
Leland, Ill.	Jonas Sawyer	Jeffery
Lesterville, S. D.	A. O. Wagner	Maxwell
Leipsic, O.	H. H. Townsend	Jeffery
Liberty, Mo.	R. A. Davidson	Jeffery
Logan, O.	Studebaker Garage	Studebaker
Long Pine, Neb.	E. C. Engle	Oakland
Loup City, Neb.	A. C. Ogle	Oakland
Lyndonville, N. Y.	Kenyon & Bidleman	Oakland
Manchester, Ia.	Strickland & Strickland	Oakland
Manteno, Ill.	O. C. Shreffler	Jeffery
Marietta, O.	Marietta Motor Car Co	Jeffery
McDonald, Pa.	McDonald Auto Co	Oakland
Middleburg, Vt.	Cobb's Garage	Marathon
Middletown, N. Y.	North End Garage	Maxwell
Milledgeville, Ill.	Miller Brothers	Maxwell
Milford, O.	Milford Motor Co	Oakland
Montreal, Que.	H. W. Spencer & Co	Brockville
Montreal, Que.	Motor Transport Co	Peerless
Montreal, Que.	Prim & Co	Simplex
Montevideo, Minn.	J. H. Seelye	Oakland
Manitowoc, Wis.	Hall Brothers	Maxwell
Monowi, Neb.	E. W. Allen	Maxwell
Morgantown, W. Va.	City Auto Co	Jeffery
Murdock, Neb.	William Gehrts	Maxwell
Napa, Cal.	E. J. Knox	Maxwell
Negaumee, Mich.	J. J. Wentla	Oakland
Neligh, Neb.	Clyde Foreman	Oakland
Niagara Falls, N. Y.	Peter Lammerts	Maxwell
Norfolk, Va.	Allen Motor Co	Jeffery
Norwich, N. Y.	L. A. Cevasco	Jeffery
Oakdale, Neb.	H. L. Ingalsbe	Oakland
Oakland, Cal.	C. R. Allen	Maxwell
Oakland, Ia.	F. W. Pierce	Oakland
Odell, Ill.	Cosgrove & Cleary	Moon
Ogdensburg, N. Y.	Percy W. Dawley	Jeffery
Okmulgee, Okla.	William A. Burke	Franklin
Owosso, Mich.	M. Kalaher	Chevrolet
Oxford, Mich.	D. L. Bronson	Maxwell
Pacific Grove, Cal.	Culp Brothers	Maxwell
Paducah, Ky.	E. Guthrie Co.	Oakland
Palmyra, Ill.	Bell Hart Tool Co	Maxwell
Paris, Ill.	O'Hair & Alexander	Maxwell
Pittsfield, Mass.	Pittsfield Carriage Co	Franklin
Platte, S. D.	Charles S. Just	Oakland
Portland, Ore.	Northwest Chevrolet Motor Car Co	Chevrolet
Prairie du Chien, Wis.	John I. Keller	Maxwell
Philadelphia, Pa.	Gibbons Wetherill Service Co	Maxwell
Punxsutawney, Pa.	P. L. Brown	Oakland
Rankin, Ill.	Gus Droll	Ford
Ravenna, Neb.	Louis Vesely	Oakland
Rhinelander, Wis.	Oneida Garage & Machine Co	Moon
Rockland, Me.	Rockland Auto Sales Co	Oakland
Rockwood, Mich.	Austin B. Chapman	Oakland
Romeo, Mich.	H. L. Turner	Maxwell
Richland, Ga.	W. L. Chappell	Maxwell
Sandusky, N. Y.	W. J. Joslyn	Maxwell
San Francisco, Cal.	Bonnheim-Moore Motor Car Co	Maxwell
San Francisco, Cal.	Reo-Pacific Auto Co	Chevrolet
San Francisco, Cal.	Linz-Sanborn Motor Co	Maxwell
Santa Cruz, Cal.	C. M. Bias	Maxwell
Santa Barbara, Cal.	E. G. Ord and C. C. Hunt	Cartercar
Seattle, Wash.	Louis and Edward Roesch	Velie
Santa Rosa, Cal.	J. P. Muenzer	Maxwell
Sargent, Neb.	David T. Adams	Oakland
Selinsgrove, Pa.	Fisher Garage	Maxwell
Saskatoon, Can.	Franklin Automobile Dealers	Franklin
Shelbyville, Ind.	Means & Wagner	Maxwell
Sherbrooke, Que.	Sherbrooke Motor Car Co	Cole
Sherbrooke, Que.	J. F. O'Donnell	Hudson
Shenandoah, Pa.	John Paskey	Maxwell
Springfield, Mass.	Waverley Auto Garage	Partin-Palmer
Springfield, Mass.	J. W. Chesebro & Co	Moon
Sheboygan, Wis.	E & H Motor Co	Franklin
Smithland, Ia.	L. N. Gambs	Maxwell
Sioux City, Ia.	Hoeven Auto Co	Westcott
Stapleton, N. Y.	Louis Blum	Maxwell
Sterling, Ill.	Sterling Garage	Maxwell
Somerville, Mass.	A. G. Norton	Economy
Stockton, Cal.	A. Bonzi	Oakland
Stuart, Neb.	Wm. Kretter Co	Maxwell
Spirit Lake, Ia.	Hartman & Hurd	Maxwell
Springfield, Neb.	Johnson & Armstrong	Oakland
Sunny Mill, Ill.	Arthur Lawson Co	Maxwell
Sutton, Neb.	J. Bender & Son	Oakland
Tabor, S. D.	Tabor Motor Co	Maxwell
Tabor, S. D.	J. E. Beagle	Oakland
Tacoma, Wash.	J. A. Croston	Chevrolet
Terre Haute, Ind.	Terre Haute Auto Co	Franklin
Towanda, Pa.	Towanda Motor Co	Maxwell
Tripole, Ia.	Tripole Implement Co	Maxwell
Twin Falls, Ida.	Edward S. Johnson	Maxwell
Tyndall, S. D.	Robinson Auto Co	Oakland
Valley, Neb.	George Cowles	Oakland
Vancouver, B. C.	Harold C. Mors	Ohio
Valentine, Neb.	Valentine Auto Co	Maxwell
Washington, D. C.	Pollock Car Corp.	Oakland
Westfield, N. Y.	Main Street Garage	Maxwell
Wheaton, Kans.	Kufahl Hardware Co	Maxwell
West Lebanon, Ind.	Ira Cadwallader	Maxwell
Wheaton, Minn.	Neuman's Auto Sales Co	Maxwell
Washington, D. C.	P. L. Paylor	Krit
Waterman, Ill.	Kit Carson	Maxwell
Watsonville, Cal.	Century Garage	Maxwell
Waverly, Ill.	T. S. Harris	Maxwell
Weston, Mo.	Weston Auto Co	Jeffery
Westfield, Ia.	T. J. Martin	Maxwell
Wharton, O.	Mrs. T. J. Howard	Maxwell
Wheeling, W. Va.	H. M. Bratton	Jeffery
White Lake, S. D.	W. B. Huebl	Oakland
Worthington, Minn.	Dr. J. T. Smallwood	Jeffery
Woodstock, Ill.	Woodstock Improvement Co	Maxwell

COMMERCIAL CARS

Town	Agent	Make
Boston, Mass.	Frank L. Roberts Co	Velie
Minneapolis, Minn.	Alex R. Curtis	Crow-Elkhart
Minneapolis, Minn.	C & S Motor Car Co	Motokart

Brief Business Announcements



TWO hundred and nineteen representatives of the Firestone Tire and Rubber Co. from all parts of the United States and Canada attended the recent sales convention at the Akron factory and "looked pleasant, please" while the photographer pressed the bulb. Several floors of the largest hotel in the Ohio city were reserved for the visitors, a turtle, fish and chicken dinner opened the festivities and 2 days were spent in the inspection of the tire and rim plants, listening to efficiency talks and studying the tire industry.

ST. LOUIS, Mo.—Bert and Otto Slosser have opened a garage on Olive street in a two-story building.

Buffalo, N. Y.—J. M. Watson, Jr., of Buffalo, has secured the agency here for Mohawk tires.

San Francisco, Cal.—H. O. Jones has recently been appointed San Francisco sales manager of the Auburn Sales Co.

St. Louis, Mo.—The International Harvester Co. is the latest motor car concern to secure a location on Locust street. The company has moved into its new quarters at 3116 Locust street.

St. Louis, Mo.—Theodore P. Goll, at present secretary of the Phoenix Automobile Supply Co., will become vice-president and general manager of the General Motor Car Co., Hupmobile distributors in St. Louis.

Boston, Mass.—A. L. Danforth, for some years with the Alvin T. Fuller Co. of Boston, agent for the Packard, resigned recently to accept a position as manager of the retail department of the Cadillac Automobile Co. of Boston.

Cleveland, O.—The opening of a service station at Euclid avenue and East Sixty-fifth street by the Perfection Spring Co., is a forerunner of other stations the company will operate elsewhere, notably New York and Chicago. Springs of every make of car are repaired or replaced at these stations.

Gary, Ind.—With the coming of the new year, Dorman & Sykes opened a new fireproof garage with 7,000 square feet of floor space. The name of their new quarters will be the Fifth Avenue Garage, but it is not connected with the former Fifth Avenue Garage of this city which went out of business a year ago. The firm is local representative for the Ford and Buick lines.

Wilmington, Del.—On the application of William D. Haddock, vice-president of the Bradford Co., a local motor car concern, J. H. Nixon has been appointed receiver for the company by Chancellor Nicholson. Mr. Nixon has been the manager. The company has one of the largest garages in the city and also maintains a large agency, shop and taxicab business. Mr. Haddock and Mr. Nixon have formed a company known as the Haddock-Nixon Taxicab Co., which will maintain a taxicab service in the city, using Empire and Pullman cabs.

Lancaster, O.—Clifton Friend has opened a garage and tire vulcanizing works at 531 East Main street.

Baltimore, Md.—The Carl Spoerer's Sons Co. is handling the Diamond and Kelly Springfield tires in this territory.

Philadelphia, Pa.—T. S. Johnston has been appointed branch manager of the Oakland Motor Car Co., vice E. K. Leech, resigned.

Seattle, Wash.—Punctura, a fluid made by the Punctura Co., Inc., of San Francisco, is now represented in Seattle. Quarters have been engaged at 909 East Pike street, under the management of Otto Boettinger.

Columbus, O.—The Neil Auto Livery Co., located at 46 West Capital street, is the name of a new concern which has taken over Sitgreaves Auto Livery Co. C. A. Weinmann and F. L. Huesmann constitute the new company.

Springfield, Mass.—Louis J. Sackett, a member of the Boston salesforce of the Jackson Motor Car Co., resigned recently to accept a position as manager of the McKee Automobile Co. of Springfield, Mass., agent for several cars and trucks.

Indianapolis, Ind.—To provide greater facilities for distribution, the Hartford Suspension Co. has taken the new building at 425 North Capitol boulevard, as a new location for its Indianapolis branch, the former quarters having been at 448-50 North Capitol boulevard.

Hartford, Conn.—S. A. Foster, Rambler dealer, has removed from Elm street to 343 Trumbull street, in the Ashwell service station. Foster's old location is now occupied by Russel P. Taber, Reo distributer, as a service station in connection with the 50 hours of free service given all purchasers of 1914 Reo cars.

Montreal, Que.—After nearly 9 years connection with the John Millon & Son, Ltd., R. S. Higgins, of Montreal, has tendered his resignation to form a partership with James F. Lee, of the Ontario Motor Supply Co., Toronto, for the establishment of a distributing station in Montreal for Firestone tires. The Quebec headquarters will be located at 21 Phillips Square, Montreal, and will be known as the Higgins & Lee Motor Tire Co.

North Baltimore, O.—Campbell & Mong have opened a garage on North Main street, North Baltimore, O.

Oakland, Cal.—H. E. Esterly has been placed in charge of the United States Tire Co.'s branch in Oakland, Cal.

Dayton.—The M. Weber Co., of 218-220 North St. Clair street, is the name of a new concern organized to build bodies and tops for Ford cars.

Columbus, O.—The Mercer Auto Sales Co., formerly located on West Capital street, has opened new storerooms at 23-25 North Front street. The concern is agent for the Mercer and Simplex and the Imp cyclecar.

Los Angeles, Cal.—The Bulldog tire has invaded the southern California field. A direct factory branch has been opened in Los Angeles by Van Deman & Wainwright. The new branch is in charge of A. J. Reynolds.

Fremont, O.—The Monarch Mfg. Co., of Fremont, O., has placed on the market the Monarch emergency robe designed for users of motor cars. It is claimed to be fireproof and windproof and can be used to cover the motor in cold weather.

Milwaukee, Wis.—Clifford E. Golder, formerly president and general maanger of the Curtis Automobile Co., Milwaukee, distributor for the Reo, has been appointed manager of the commercial vehicle department of the Milwaukee branch of the Kisselkar.

Wilmington, Del.—Enoch Moore, Jr., vice-president of the Hansen Automobile Co., 815-23 Tatnall street, has purchased, for $15,000, the garage now occupied by the Foss-Hughes Co., on Gilpin avenue near Jackson street, buying it from Grantley P. Postles, the owner.

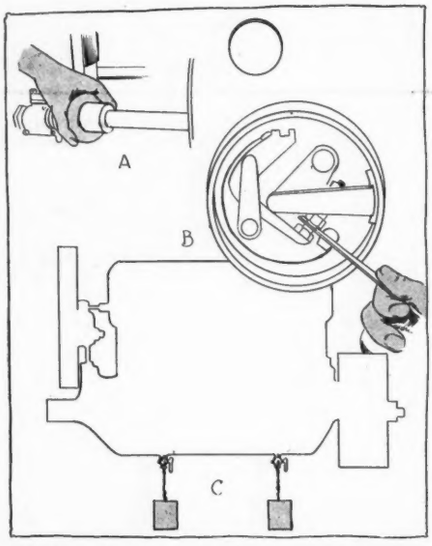
Kansas City, Mo.—The Kansas City branch of the Hartford Suspension Co. has been moved from 1524 to 1803 Grand avenue. The new location will supply additional facilities for the company's trade in Truffault-Hartford shock absorbers, jacks, bumpers and electric starters. Henry Roemer is in charge of the Kansas City district.

The Motor Car Repair Shop

FORD owners sometimes are desirous of converting their roadsters into vehicles capable of doing speed work, and many hints may be gained from the method described below, which is that used by F. L. Angier, Streator, Ill., who claimed to have tuned up Ford cars which could do from 55 to 60 miles per hour.

The first step in the conversion is to remove all the unnecessary parts, such as the running boards, fenders, body, etc. The steering post is dropped slightly and bucket seats fastened to the frame. A pressure fuel feed system is fitted and a pump attachment for forcing oil to the motor crankcase.

The motor then is disassembled and the bearings carefully fitted, the main bearings



MOTOR PARTS SOMETIMES FORGOTTEN

A—Gripping a magneto or pump coupling to see that the parts all are in line. The forefinger and thumb are usually slipped over the periphery and should one part be high and the other low the shaft may run out of alignment.

B—Filing the breaker points of the magneto. This may not be necessary for even a year, but when misfiring does occur it would be well to examine the points

C—Method of testing for a leaky center bearing in a motor with a two-compartment crankcase and a three-point suspension crankshaft

being worked in by turning the flywheel by a belt for 4 to 6 hours. The pistons and connecting rods next are weighed. After four pistons of exactly the same weight are obtained, they are counterbored to assist lubrication. The connecting rod bearings are cut with oil ducts to insure good lubrication. The oil feed pipe which passes through the motor is made larger, and with openings about equal distances for each connecting rod drop. The funnel attachments are made five to six times larger than the ones supplied.

The piston rings are carefully lapped-in

Tuning a Ford for Racing

with an old piston and then fitted to the regular piston. About 3/64 to as much as 3/16 inch of metal is removed from the cylinder head, this work being accomplished easily, for the cylinder head is removable. The flywheel is made a little larger in diameter to get added weight. With the above changes the compression should be in the neighborhood of 60 to 75 pounds per square inch.

The present intake manifold is discarded and a brass one about ¼ inch larger fitted, care being taken to see that the inner surface of the header is smooth. The high-tension magneto has been found to give better results than the system employing coils. The make of carbureter and magneto is entirely one of personal choice, as many of the prominent makes have been found to give excellent results.

The camshaft must be reset and only experiment gives the proper timing. Different settings are tried and the one giving the best results finally adopted. Should the clutch slip, it is best to insert another disk than to take up on the spring, it is stated.

Many Helpful Hints

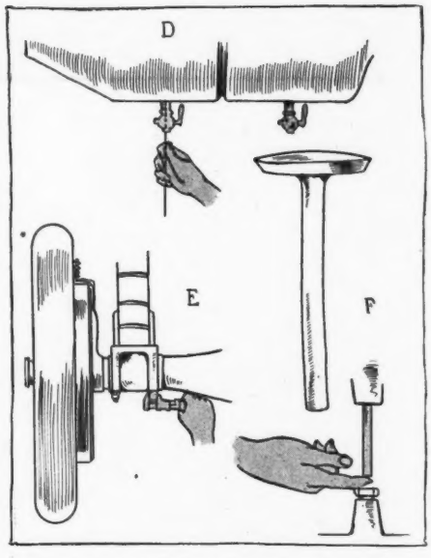
In resetting the magneto, the coupling often may be placed so as to cause the magneto shaft to be out of alignment. The best method is to note the condition of the coupling before being removed, which is done by slipping the thumb and forefinger around it, as shown at A in the illustration. The periphery should be perfectly smooth and one side should not be higher than the other, as shown in the detail of the illustration. In resetting the coupling clean it well and see that the outer surfaces of the parts are in line.

It is not very often that the magneto needs attention, but when it does go wrong it is due usually to dirty or uneven breaker-points. Run a file between the points when trouble is noted. The file to be used may be a very fine nail file, if a regular magneto file is not obtainable.

In motors with two-compartment crankcases and three-bearing crankshafts it happens sometimes that the center bearing leaks and one compartment will be flooded with oil while the other will be below level. A good way to test for a leaky center bearing is to first drain all the oil from both compartments. Then place the same quantity of oil in each side slightly above the ordinary level. Adjust the pump to feed the same amount to each reservoir. The motor then is operated for a day or two. Place a pint cup under each drain-cock as shown at C and then open the cocks. Note the difference in the quantity of overflow oil from each side and then a fair idea of the amount of leakage may be gained.

Often the drain-cock will be opened and no oil will flow, and no matter how much oil is placed in the case none runs from the cock. This may be due to a clogged drain-cock, and to clear the passage a piece of wire should be forced through as shown at D.

The spring clips are, in nine out of ten cases, neglected car parts. Especially on new cars the clips should be tightened, as at E, once each week for about ten weeks, as the metal stretches slightly when in use. It is well to inspect the clips once each month on old cars and take up as much as possible on the holding nuts.



TROUBLE-GIVING MOTOR CAR PARTS

D—When a crankcase petcock is opened oil does not always run out even though the case is filled over the level. The petcock may be clogged with sediment. An easy way to remove this and make the drain operative is to insert a piece of wire as shown

E—The spring clips of a new car should be tightened once each week for ten weeks as the metal stretches. The clips should not be neglected on old cars

F—A bent valve stem often causes misfiring. In testing for a bent stem the valve is placed in position and lifted up as shown. It should drop of its weight

A bent valve stem invariably will cause trouble by sticking open and thus causing misfiring of the cylinder in which it is operating. In testing for a bent stem, which hardly is noticeable to the eye, place the valve in its guide and with the forefinger, as shown at F, gently lift the stem. It should move freely and drop back to normal position of its own weight. If it does not, clean the stem and guide and try again. If the stem and guide are clean the former may be bent.

Why?

Why are more 1914 American cars equipped with Stromberg Carburetors than any other?

STROMBERG CARBURETORS

"The Accepted Standard"

Why do more high-price quality cars carry Stromberg Carburetors than any other?

Why is America's greatest road racing car equipped with a Stromberg Carburetor?

Why are the best advertised cars in America equipped with Stromberg Carburetors?

Why, despite the fact that Stromberg Carburetors cost more than any other on the market?

STROMBERG MOTOR DEVICES CO.

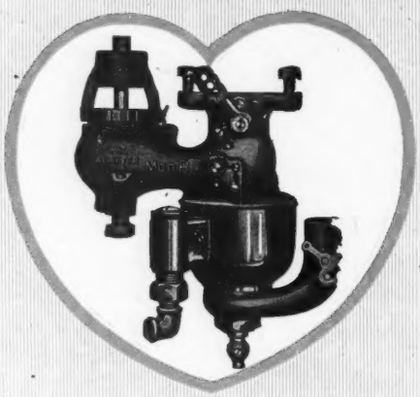
55 East 25th Street, CHICAGO, ILLINOIS

Distributors and Service Stations in All Principal Cities

BRANCHES
New York
Boston
Detroit
Indianapolis
Minneapolis

BRANCHES
Los Angeles
Portland
Fresno
Seattle
San Francisco

SCHEBLER



Model R 1914

CARBURETOR

Correct in Principle
Simple of Adjustment
Automatic in Action

Sure Starting
Greater Power & Speed
Better Economy

Wheeler & Schebler · Indianapolis Ind ·

"Pioneers in Perfection of Carburetion"

BRANCHES:

Fry & McGill Motor Supply Co. Denver, Colo.	Wheeler & Schebler.....Chicago
Automobile Accessories Co...Pittsburgh, Pa.	Wheeler & Schebler.....Detroit
Ferris-Dunlap Auto Supply Co..Dallas, Tex.	Fred Campbell.....St. Louis, Mo.
Interstate Electric Co.....New Orleans, La.	W. J. Connell.....Boston, Mass.
Reinhard Bros. Co.....Minneapolis, Minn.	Equipment Co.....Kansas City, Mo.
Manufacturers' Supply Co Philadelphia, Pa.	Elyea-Austell Co.....Atlanta, Ga.
Weinstock-Nichols Co....Los Angeles, Cal.	J. C. Nichols.....New York City
Pennsylvania Rubber & Sup. Co..Cleveland	Weinstock-Nichols.....San Francisco

Fairbanks, Morse & Co., Ltd., London, England
Canadian Fairbanks-Morse Co. (All principal Canadian Cities)

IN January 1912—two years ago—we ran this advertisement.

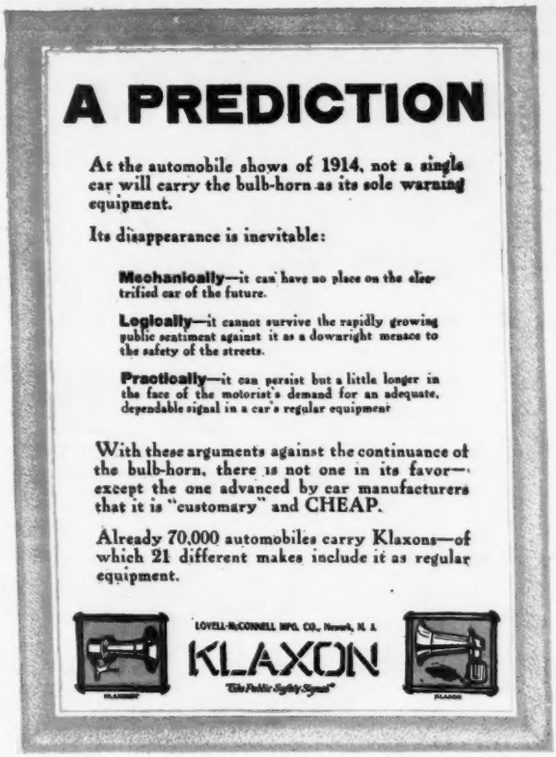
At the shows this year you will see that the prediction has come true.

You will find there not one car with the bulb-horn as sole warning equipment.

TODAY 66 cars are Klaxonized. In the list—with but one or two exceptions—is every high-grade car made.

Other cars carry what their makers call an "electric horn."

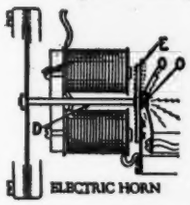
These operate on the familiar "buzzer" principle. They can be bought by car makers for $1.25 to $2.00—even less than the cost of a bulb horn.


A PREDICTION
At the automobile shows of 1914, not a single car will carry the bulb-horn as its sole warning equipment.
Its disappearance is inevitable:
Mechanically—it can have no place on the electrified car of the future.
Logically—it cannot survive the rapidly growing public sentiment against it as a downright menace to the safety of the streets.
Practically—it can persist but a little longer in the face of the motorist's demand for an adequate, dependable signal in a car's regular equipment
With these arguments against the continuance of the bulb-horn, there is not one in its favor—except the one advanced by car manufacturers that it is "customary" and CHEAP.
Already 70,000 automobiles carry Klaxons—of which 21 different makes include it as regular equipment.
LOVELL-McCONNELL MFG. CO., Newark, N. J.
KLAXON
"The Public Safety Signal"

ANOTHER PREDICTION

At the Automobile Shows of 1916, not a single car will carry an electric "buzzer" horn.

It is known in the trade as the "50% come-back" signal. This percentage at least is soon returned by dissatisfied users.



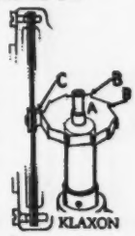
It is mechanically impossible to make an electric buzzer that will stand up.

Each vibration of the diaphragm means a hot electric spark between the points (O-O). Unless these points are made of platinum iridium—the cost of which is prohibitive—they soon burn out and the buzzer is useless.

The NOTE of the buzzer horn has not sufficient carrying power to meet road conditions. Its diaphragm is merely jarred or "buzzed against" by a leaf spring (E) flapping against the rod (D). The resulting sound waves are weak and of short duration.

Indoors—in the dealer's show-room where the noise is confined—the buzzer may seem loud enough. It is in the ROAD TEST that the motorist learns its inability to carry.

The Klaxon is not an "electric horn"



The Klaxon is a MACHINE—built to produce big, clean-cut sound waves of great carrying power. These waves are made separately—each by a big swing of the steel diaphragm.

The swings are caused by the revolutions of a high-speed wheel (A) with specially designed cam faces (B-B)—driven by an electric motor.

These cam faces push against the button (C) which is in the center of the Klaxon diaphragm. The diaphragm is thus pushed forward and back 25,000 times per minute—producing the characteristic Klaxon note: loud, clear, penetrating.

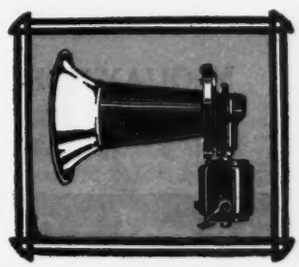
Button and wheel are of glass-hard steel. They can never wear out. Hence the Klaxon guarantee of PERMANENTLY satisfactory service.

KLAXONET

Lovell-McConnell Mfg Company Newark, N.J., U.S.A.

KLAXON

"The Public Safety Signal"



This advertisement planned, written and set up entirely in the Klaxon Factory. Type composition by the Klaxon Press with "Klaxon" type especially designed by Goudy.

If it's not a 2-piece ring it's not a LEAK-PROOF Ring

PATENTED

¶ You'd certainly object to having a hole bored through your piston head—or, if you found such a hole, you'd plug it. You know you couldn't expect perfect compression with a "holey" piston head. Now, what's the difference whether the leak runs through the middle of the piston head or is down the side between it and the cylinder wall? It's just as much a leak.

¶ Old style, one-piece piston rings with their openings and their poor bearing on cylinder furnish the "hole down the side." They're bound to leak compression and the older they get the greater the leakage. It is to cut out this "down-the-side-leak" through and by the piston ring that *Leak-Proof Piston Rings* are used.

What They Mean to Your Engine

Give perfect compression—prevent gas leakage. Won't let surplus oil get up into the combustion chamber—this means minimum carbonization. Make a cleaner, smoother-running engine. Retain equal tension on cylinder and will not mar smoothness or roundness of cylinder walls.

¶ *Leak-Proof Piston Rings* are made of two pieces and have no unsealed openings; the flange of each section completely plugs the opening in the other. They can't leak. They are absolutely gas-tight. Their two-piece construction on the angle-iron principle—an exclusive and patented feature—makes them stronger than either a one-piece ring or a ring made of more than two pieces. *Leak-Proof Piston Rings,* being made on this two-piece angle-iron principle, are concentric instead of eccentric, and have equal tension on the cylinder walls. They are made of Processed Gray Iron which retains its elasticity under the constant heating and cooling to which piston rings are subjected in service. Softer than the cylinder, yet more lasting than the motor. Made in all sizes—easily adjustable.

Read our Free Booklet

It will tell you more about *Leak Proof Piston Rings* and their relation to power and cylinder life. Why it will pay you to use them. This book will interest you if you're interested in power conservation. Write for it.

"ASK THE USER"

In Use on Over 150,000 Automobiles

PISTON HEAD PACKING RINGS
PATENTED

Sold by all up-to-date dealers, garages and repair shops.

Manufactured by

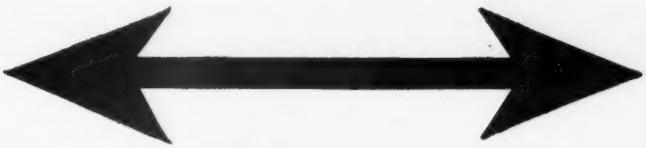
McQUAY-NORRIS MANUFACTURING CO., Dep't. M, St. Louis, Mo.

Branch Offices:

NEW YORK—53 Lincoln Sq. Ct. B'way at 64th St.
PITTSBURGH—7620 Tioga St.
KANSAS CITY—1504 Grand Ave.
CHICAGO—Suite 39, Merchants' Bldg., 106 No. LaSalle St.
SAN FRANCISCO—164 Hansford Bldg.
LOS ANGELES—224 Central Bldg.
CANADA—W. H. Banfield & Sons. No. 120 Adelaide Street West, Toronto.

If it's not a 2-piece ring it's not a LEAK-PROOF Ring

Two Faces May Look Alike But How About the Insides Behind the Faces?



Imitators Make Batteries Which Look Good On The Outside

but contain only 80% of Battery brains to compete with the **EXIDE**'s 100%.

And it's the brains put into construction—the insides of the battery, that count—that make all the difference between a good battery and a poor one.

Don't experiment—it's unnecessary—we have done the experimenting for you—and when you consider that the **EXIDE** is used by more than 100 automobile manufacturers, doesn't it look like an absolutely safe battery for you to adopt for use with your Electric Lighting and Starting equipment?

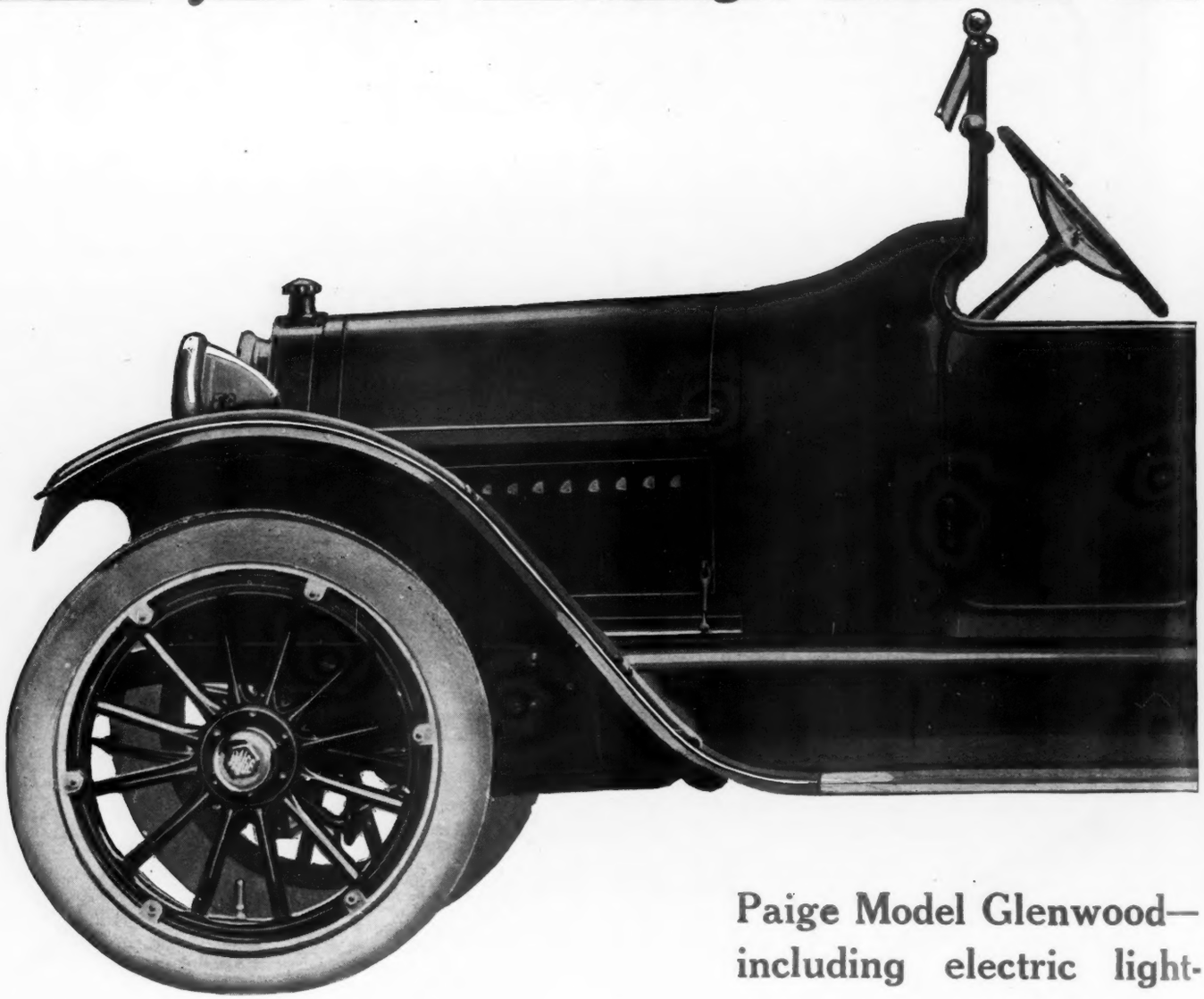
WILLARD STORAGE BATTERY CO., Cleveland, Ohio

New York Branch: 136 W. 52nd St. **Chicago Branch: 2241 Michigan Ave.**
Detroit Branch: 1191 Woodward Ave. **San Francisco Branch: 243 Monadnock Bldg.**
Indianapolis Branch: 438 and 439 Indiana Pythian Bldg.

SERVICE STATIONS IN ALL PRINCIPAL CITIES IN THE UNITED STATES, CANADA AND MEXICO.

(81)

When you see the Paige Cars at the



Paige Model Glenwood—including electric light-

YOU have doubtless heard that Paige cars possess great extra value.

Possibly you know something of the Paige organization and know why it is possible for the Paige Company to put more value into their cars than competing makers—that the Paige capitalization is only $250,000 compared with capital stocks running into the millions—that entire freedom from bonded or other indebtedness gives the Paige Company a distinct advantage—that overhead expense is kept down to the extreme minimum.

But what does all this mean to you men who buy, sell or might sell Paige cars? What do you actually get in a Paige car that you can't get elsewhere for the same money?

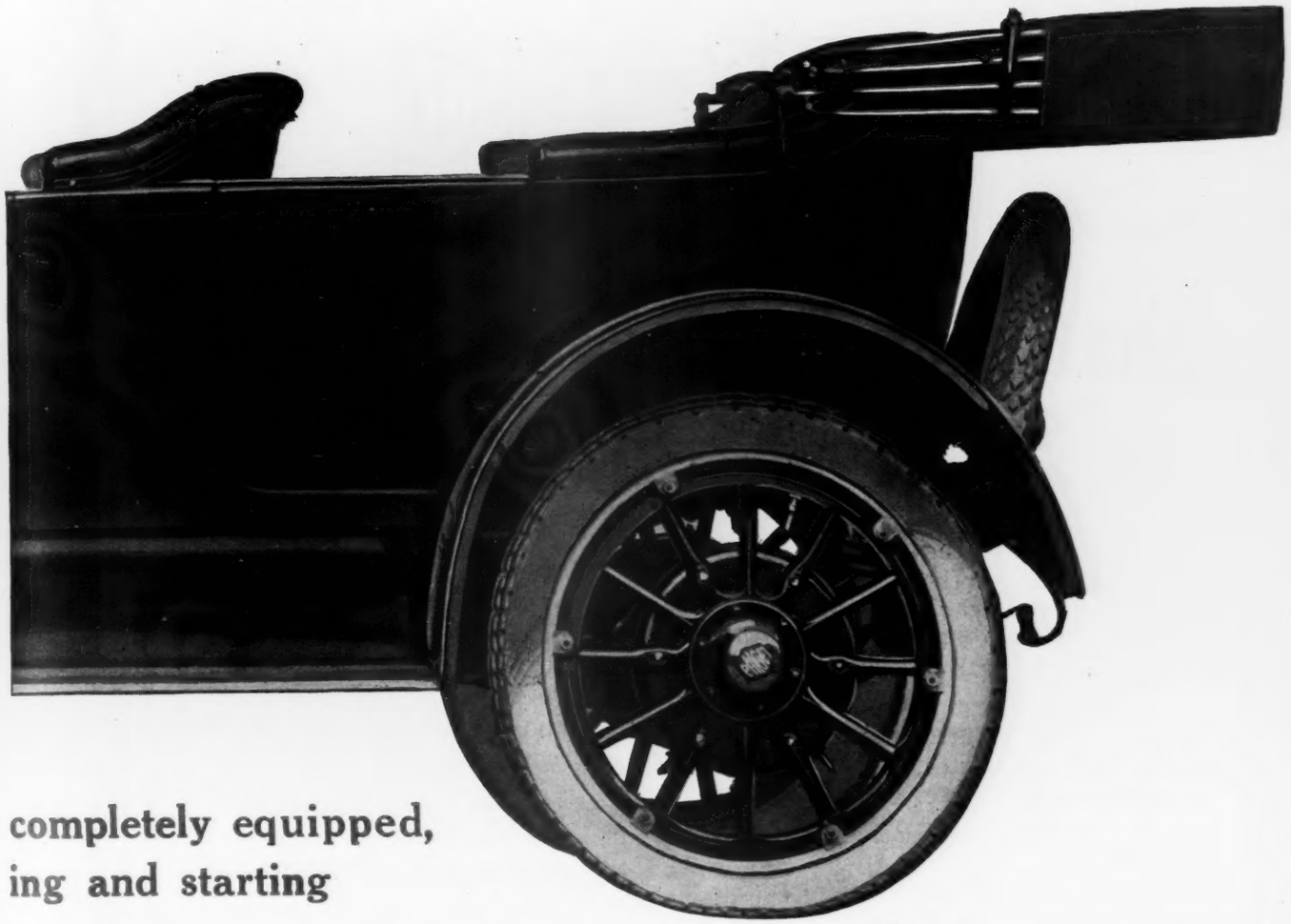
You will find extra value **all through** a Paige car—on the outside where you see it at first glance, and of more importance, down underneath, where you won't fully appreciate it until you have the car in service. You will find it in the materials, in the workmanship, in the equipment.

But just for example note a few of the points that you can check for yourself when you are comparing car values at the shows.

Take the electric lighting and starting system. See if you can find a car selling at anywhere near the Paige "36" price equipped with the large unit Gray and Davis system. The Paige Company might have used the small system or a cheaper make and thereby saved half the total amount of their capital stock on one year's production.

Paige-Detroit Motor Car Company,

Shows check these extra value features



completely equipped, ing and starting

Then the Bosch magneto, admittedly the finest magneto made. We could save $80,000 this year if we were content to use one of the cheaper magnetos that other makers think good enough to go into their cars.

And the silent chain drive for the motor shafts. Everyone knows this is the best but it costs more—a lot more—about $190,000 to be exact to use this on our year's production than the ordinary train of noisy gears.

Then think of getting a multiple disc cork insert clutch on a car at the price asked for a Paige. This costs us about $100,000 more per year than would an ordinary multiple disc clutch.

These examples show in part what the ideal conditions existing in the Paige business mean to Paige buyers.

These figures show the actual savings that we might effect by cheapening our cars in the ways mentioned—savings that would amount to between two and three hundred dollars per car. And the cars would still be up to the standard of other cars in the Paige price field.

With these facts in mind you are going to examine the Paige exhibits this year at the shows with more than ordinary interest.

You will remember that last year Paige cars were at least one year ahead of competition.

Now see what we have done to still further enhance the value of our product.

We have designed a beautiful streamline body,—a body that would look well in cars listing at three to five hundred dollars more.

We have added curved fenders. We will use the celebrated Gray & Davis lamp equipment-single wire system. Dimmers in the headlights have replaced the side lights. Starter control has been simplified. The latest type of genuine rain vision bottom ventilated windshield has been added. A change of the instruments on the dash will make them even more convenient than ever.

We desire to go on record as saying that this new series Paige "36" is even still further in advance of competition than it was one year ago.

We invite you to check these statements we have made when you see the Paige cars at the show.

In this way you can prove them for yourself.

Or, if you are unable to attend the shows see the Paige models at your dealers. You will find the famous Paige "36" Touring Car, Roadster and new model Speedster selling at $1,275. Also two closed body types selling at $1,850 and $2,250 and the Paige "25" touring car and Roadster at $975.

Dealers—this is going to be another Paige year. There is some territory still available.

For further information wire or write

304 Twenty-first Street, Detroit, Michigan

$2400
FIVE-PASSENGER

$2400
FOUR-CYLINDER

More Power **More Endurance**

Shatters World's Records for Power and Endurance

For 336 hours the Moline-Knight motor has been on the testing block in the laboratory of the Automobile Club of America, under the supervision of A. C. A. Officials.

During this test it ran without a stop, or an adjustment of any kind to the motor, carburetor, spark plugs or magneto—a feat never before equaled in the history of the motor car industry.

It ran for two weeks, day and night, at 1100 revolutions per minute, averaging 38 H. P.—the A. L. A. M. rating requiring only 29.16 H. P. at this number of revolutions.

At the end of 336 hours, the speed was increased to 1682 revolutions and developed 53.6 H.P. A.L.A.M. rating, justifying our claim of guaranteed 50 B. H. P.

In its world record breaking feat the Moline-Knight motor traveled the equivalent of 14,700 miles on level at the rate of 45 miles per hour and steadily climbed an 8 per cent. grade 10,000 miles long at the rate of 27 miles per hour, which is equal to 14 trips between New York and Chicago or 5 trips from the Atlantic to the Pacific.

$10,000 CHALLENGE

To all makers of Poppet Valve Motors, regardless of price, piston displacement, horse power or number of cylinders (Sixes preferred) we challenge you to place your motor in the laboratory of the A. C. A. and duplicate the World's Record made by the Moline-Knight, under the same conditions.

The "Four" that makes the "Six" unnecessary

MOLINE AUTOMOBILE CO., East Moline, Ill.

MOLINE KNIGHT

New Departure Ball Bearings

American Made for American Trade

Like the Panama Canal, the New Departure ball bearing is the product of American experts.

The New Departure ball bearing was first offered to the trade something like six years ago, but the actual work of producing and perfecting this bearing started more than a decade back of that time when this Company began its experience in the manufacture of New Departure, anti-friction, ball bearing bicycle hubs.

The finesse of the art was reached when experts were employed to exhaustively study the manufacture of anti-friction bearings in all parts of the world. These men were instructed not only to learn what had been done, but to improve upon methods, processes, and results that marked the ultra attainments at that time. This work has absorbed a vast amount of investigation, investment, and invention, all and always with the American determination to excel.

Result—The ball type of bearing was selected because it more completely eliminates friction and, therefore, fulfills the purpose of an efficient bearing.

Result—Ten and a half acres of modern machinery, operated by 2,000 skilled artisans, producing 10,000 guaranteed ball bearings per day.

To quote an old axiom, "Nothing succeeds like success."

Literature on request. Co-operative engineering service for the asking.

The New Departure Mfg. Co.

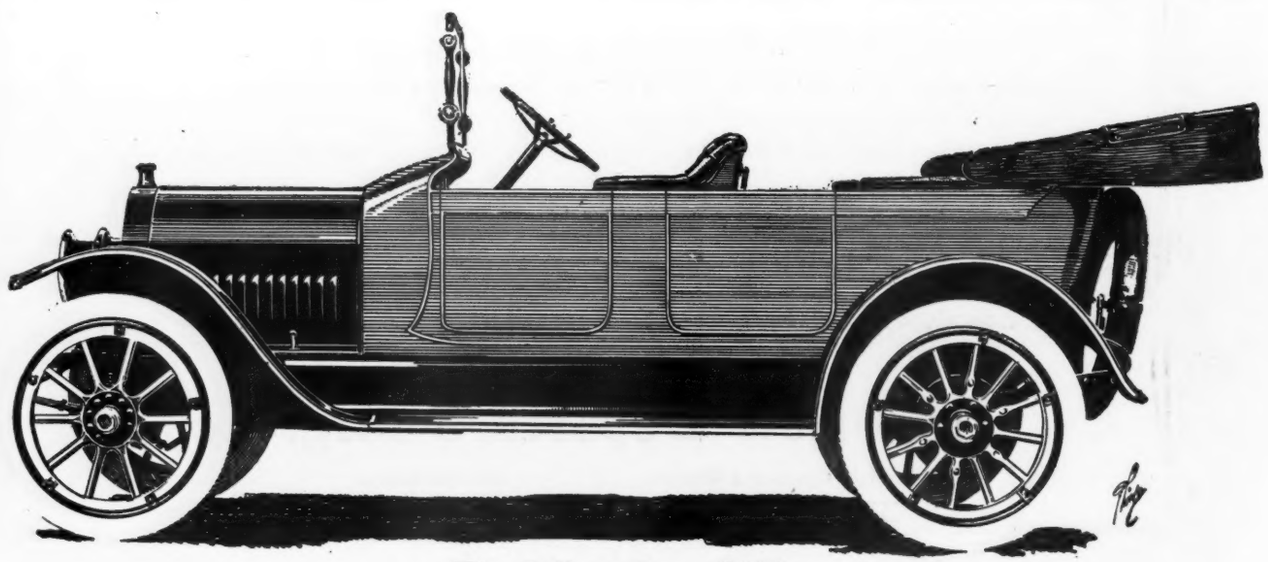
Main Office and Works
BRISTOL, CONN.

Western Branch
1016-17 Ford Bldg.
DETROIT

Check Up the JEFFERY In the

ONE of the leading motor car trade journals—Motor Age—says in its last issue, in commenting on the year's developments in the industry: "One of these is the trend of popular sentiment among the middle class of buyers toward the light, inexpensive car—inexpensive in both first cost and that of maintenance. . . . This trend is one to be logically expected in America at this moment, in view of the great strides that are being made in what is termed the 'light cars' in Europe. . . . The light car influence has had effect in a reduction in the size of engines. Not all American motor car manufacturers have awakened to this public demand for more economical cars and some of those who have harkened to it have sacrificed quality, comfort and appearance in order to get economy."

NAME.	PRICE	CYLINDERS	HORSE POWER	IGNITION	CLUTCH
JEFFERY 4	$1550	4 en bloc, 95.34 x 133.34	22.5	Bosch	Leather faced cone
HOTCHKISS (French)	Chassis only—$2400	4 en bloc, 95 x 130	22	Bosch	Leather faced cone
WOLSELEY (English)	2200	4 ——, 90 x 121	20	Bosch	Multiple disc
BENZ (German)	3000	4 en bloc, 80 x 130	25	Bosch	Leather faced cone
DE DION BOUTAN (French)	2865	4 en bloc, 80 x 140	25.2	Bosch	Friction disc
STRAKER SQUIRE (English)	2150	4 en bloc, 87 x 120	18	Bosch	Leather faced cone



The Jeffery Four, $1550

With the Best Motor Cars World

The Thomas B. Jeffery Company was first to sense this cry for economy and its engineering corps, in close touch with the best European engineering practice, not only produced a car which answered that cry, but a car of the very highest quality, beauty of design and comfort to sell at a moderate price.

Because few if any of our American manufacturers are building a car equipped with this high speed, high efficiency, bloc type motor—a strictly high grade, light job, we must invite comparison of Jeffery specifications with the best cars of Europe, and that means the world. These names are as familiar to motor car enthusiasts across the water as Packard and Ford are in this country.

TRANSMISSION	AXLES	WHEEL BASE	COOLING	LUBRICATION	CONTROL	TIRES
4 speeds forward and 1 reverse	Front I beam, rear full floating	116"	Water, Centrifugal pump	Pressure feed and splash	Left side, levers in center	34 x 4", or 875 x 105
4 speeds forward and 1 reverse	Front I beam, rear full floating	126"	Water, Centrifugal pump	Forced feed and splash	Right side	34 x 4½, or 880 x 120
4 speeds forward and 1 reverse	Front I beam, rear full floating	123"	Water, Centrifugal pump	Pressure feed	Right side	32 x 4, or 815 x 105
4 speeds forward and 1 reverse	Front I beam, rear full floating	124"	Water, Centrifugal pump	Force feed	Right side	32 x 4½, or 820 x 120
4 speeds forward and 1 reverse	Front I beam, rear full floating	130.5"	Water, Thermo-syphon	Force feed	Right side	34 x 4, or 875 x 105
3 speeds forward and 1 reverse	Front H section stamping, rear full floating	109"	Water, Thermo-syphon	Force and pressure feed	Right side	31 x 3½, or 810 x 100

This chart conveys an eloquent message. It must seem perfectly plain that Jeffery offers American buyers at $1550.00 a car, in all its essentials, as high grade as the best that the world produces at twice the price.

Note that regardless of price, the specifications of the Jeffery are almost identical with the best European cars.

Jeffery brings to America what Americans are demanding, economy, comfort, beauty in a motor car built from the highest grade materials and sold at a moderate price.

The Thomas B. Jeffery Company

Main Office and Works:

Kenosha, - - - - Wisconsin

"Here Hans Sachs,.....laureate of the gentle craft,
"Wisest of the Twelve Wise Masters, in huge folios sang and laughed."
LONGFELLOW.

F & S

In hoc signo vinces.

Ball Bearing Patents and Pioneers

A timely talk on these topics

By J. S. Bretz

AS a New Year's greeting and gift to the whole industry, we modestly and unaffectedly offer Judge McPherson's classic decision in our favor, handed down almost on the very verge of the dawn of 1914, *in re* The Hess-Bright Mfg. Co. (H-B) and Deutsche Waffen- und Munitions Fabriken (D-W-F), Complainants, vs. Fichtel and Sachs (F. & S.), Defendants, for alleged infringement of Conrad's Ball Bearing Patent No. 822,723.

The learned Judge, sweeping aside all the sophistry and casuistry of the plaintiffs' hired experts, evidently regarded the suit for patent infringement as one of "Lex apparens," because in this fine legal sense the plaintiff is obliged to make his right clear by the testimony before he could summon the defendant.

Judge McPherson in his opinion says—and he thinks epigrammatically:

"But I think it clear that if the validity of the patent (Conrad H-B D-W-F) be assumed I cannot treat it as a pioneer."

"The plaintiffs do not assert, and could not successfully assert, that ball bearings were invented by Conrad. In 1904, when the application was filed at Washington, every element contained in the patent was well known—concentric rings, balls or rollers, and spacers or spreaders."

"It was not to prevent friction between adjacent balls, but to make a unitary structure, that he used the spreader," or a "crescent-shaped space would develop, and the bearing would disassemble."

"I do not think it necessary to discuss the patentability of the device, and I am not prepared to follow the plaintiff's experts, and to give the patent a construction now that makes it cover any ball bearing whatever."

In conclusion, Judge McPherson tersely summed up the case as follows:

"I think the defendants' supplemental brief summarizes accurately the material differences between the patent and the defendants' bearings:

"There are three features which the Conrad (H-B, D-W-F) patent has pointed out and emphasizes as characteristic of his alleged invention. They constitute his invention. They are:

"(1) Continuous, unnotched, and unrecessed rings;

"(2) The limited number of balls (only as many balls as can be inserted by eccentrically displacing the rings plus perhaps one), and

"(3) Distributing means, necessary to prevent the bearing from falling apart, and having that function.

"The defendants' bearings (F & S) lack each one of these characteristics and, on the contrary, contain its exact opposite:

"(1) Notched, recessed rings;

"(2) A large number of balls (from one to several more than could be inserted by displacing the rings eccentrically), and

"(3) A ball-spacing device, which is not necessary for preventing the bearing from falling apart, and has no such function."

"Without further discussion I state my opinion to be, that the defendants do not infringe; and if this conclusion be correct, the plaintiffs must fail. The defense of *laches*, which would otherwise need consideration, will not be dealt with."

"A decree may be entered dismissing the bill at the costs of the plaintiffs."

We congratulate the industry upon our success as the American representatives of Fichtel and Sachs, for at our own expense we defeated this attempted ball bearing patent monopoly—for their success would have meant a large royalty fee added to the cost of not only every imported ball bearing, but every American made ball bearing as well—really a tax upon every user of ball bearings, thus retarding the mechanical, industrial and competitive development of the ball bearing, the world's best anti-friction device.

We are sending to the industry, by mail, complete copies of Judge McPherson's full decision in this case, and from which we have quoted briefly above. Should you be further interested, we will be pleased to send you a copy upon request.

J. BRETZ COMPANY
SOLE IMPORTERS
F & S Ball Bearings
250 West Fifty-fourth, New York

National

"You don't have to raise the hood"

NATIONAL owners enjoy complete abandon of worry about mechanical parts of their cars. This confidence is found only in the perfected quality of *National* cars.

WE build *whole* cars—the name *National* guarantees them. Every *National* car is built as a *unit*—every mechanical part operates harmoniously to produce satisfactory *results*. You leave the responsibility for the *National's* mechanical construction to our years of experience—forget that there are gears and machinery operating beneath your soft cushions. You rest in comfort and give thought only to the ease and joy of motoring.

You can buy over telephone

NATIONAL owners buy performance and not specifications—they can buy their new *National's* over the telephone.

We sell our experience, ability, responsibilty and our guarantee—not a mere job of assembled wheels, axles, gears and parts. That's why you don't have to raise the hood to buy a *National*.

Lavish in comfort

BEAUTIFUL, economical efficient and lavish in comfort—this car is the climax of the *National's* success in car building since its pioneer beginning.

Brief Specifications—*National* Six

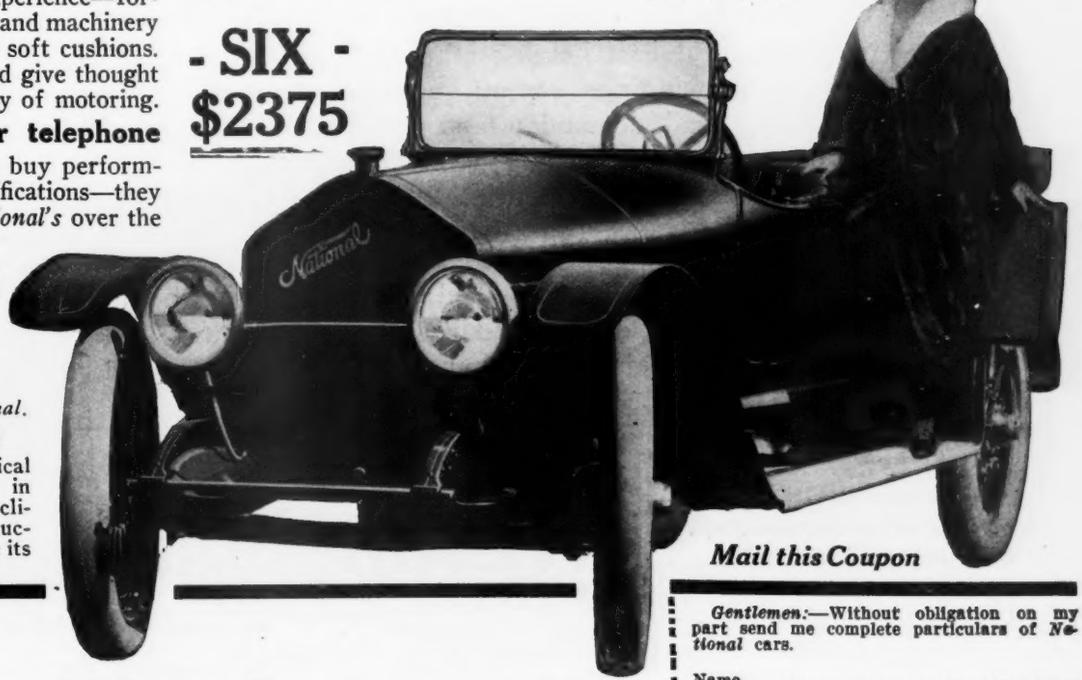
MOTOR—Six-cylinder, 3¾x5½ inch cast en bloc. Tire pump, integral part of motor. Clutch, self-contained aluminum cone. Starting and lighting, electric two unit system. Transmission, sliding gear selective type, three speeds forward, one reverse. Gauge 56 inches. Oiling, crank case constant level, force feed, with gear driven pump. Ignition, high tension, dual magneto with storage battery. Tires 36x4½. Firestone demountable rims. Air pressure gasoline feed, generated by small pump in crank case. Capacity, 23 gallons. Automatic carburetor. Two sets of brakes on 16-inch rear wheel drums. Bevel gear drive through straight line shaft with universal joints and torsion member. Full floating rear axle. Left side drive. Access all four wide doors. Single lever in center controls all speeds. Half elliptic springs, front, special National construction, rear.

EQUIPMENT—Top complete with side curtains and boot, ventilating rain vision windshield, extra Firestone rim, electric lighting and starting systems, 12-in. double bulb electric headlights, electric license tail light, Warner speedometer, electric horn, tools and jack.

National 40

THE *National* 40 is our staple car. Its years of marvelous success makes it stand out with silhouette distinctiveness against the background of all other cars. We believe this is the best all-round automobile ever made. We build on the series basis; every day begins a new year. We do not upset everything by rushing into yearly models with calendar seasons. We build on a constant system of improvements. The *National* is the accumulated product of years and not of a single season. This is the third year for this car, in all its essential features. This new series V-3 embodies all improvements. Five models, $2750 to $3400.

- SIX - $2375



Mail this Coupon

Gentlemen:—Without obligation on my part send me complete particulars of *National* cars.

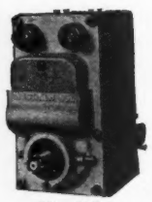
Name .....

Address .....

National Motor Vehicle Co., Indianapolis, Ind.

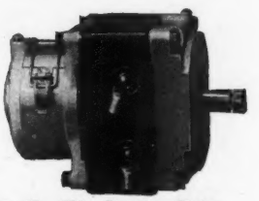
WESTINGHOUSE ELECTRIC

Westinghou Starting Ignition



No. 251
Lighting Generator

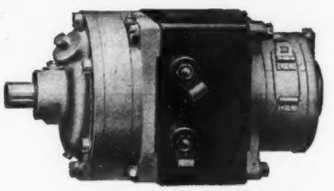
The Westinghouse Electric Systems for automobiles include equipments for all cars—suitable for various applications for most efficient and economical installation.



No. 300 Starting Motor
for Flywheel Drive

No. 230
Lighting and
Ignition Generator

The "square" design for generators and motors provides ready and sturdy mounting. Generators have magneto shaft height; inherent regulation of current by the windings; output automatically increases when lamp load demands; lesser output to battery when lamps are not burning; entirely enclosed.



No. 330 Starting Motor
for Crankshaft Drive

Starting Motors for flywheel and crankshaft applications, with and without gear sets.

No. 240
Lighting and
Ignition Generator

Materials: Cast-steel frames for strength and electrical efficiency; aluminum-alloy end brackets for light weight; "bakelite" insulation impervious to oil, water and gasoline.

Westinghouse engineers offer their services to study and advise your application of electrical equipment.

No. 502 Starting Motor
for Flywheel Drive

To Dealers and Repair Shops

Send us your name and we will mail you a complete set of instruction books on Westinghouse Electric Starting, Lighting and Ignition Systems, and place your name on our mailing list to receive new instruction books as issued.

Westinghouse Electric

East Pittsburgh, Pa.

Member Society for Electrical Development.

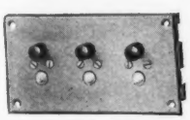
se Electric

Lighting & Systems

Illuminated Dial Meter

A Voltmeter is recommended to show condition of the battery; illuminated-dial and flush mounting styles; dial is black to avoid glare; the action is "dead-beat," permitting accurate reading; rugged and reliable instruments.

Ignition Switch



Three Gang Lighting Switch

Lighting and Ignition Switches of sturdy construction for severe service, providing positive contact with clean surfaces that minimize voltage drop.

Flush Type Meter for Wooden Dash

Starting Switches—pedal and electrically-operated styles, the latter using a simple push-button switch to start the engine; cast-iron frames for ruggedness; copper contacts; removable terminals for soldered connections.

Starting Switch for Crankshaft Motor

Fuse and Junction Boxes of heat resistant material impervious to oil, water and gasoline; enclosed fuses with indicator—avoiding danger of fire from open spark and making easy detection of blown fuse.

Electrically Operated Starting Switch

& Manufacturing Co.

Automobile Equipment Division

"Do It Electrically."

Four Circuit Fuse Box

THE SPLITDORF starting system and lighting generator, which have proven two of the sensations of the New York show, is an evidence of the determination of the Splitdorf Electrical Company to supply the demand for ignition units in their every phase, and supply them, too, better than the best on the market.

The SPLITDORF STARTING SYSTEM is simplicity itself, thanks to an automatic clutch of ingenious construction. This SPLITDORF clutch is free—there are no gears to disengage—there is absolutely no chance of it binding or wearing when the motor is running. As the engine stops the clutch becomes automatically engaged for re-starting. The motor, a 12-volt battery, a transmission reducing gear and a switch complete the positive starting outfit.

The SPLITDORF LIGHTING SYSTEM has the cleanest possible installation and is, above all, reliable. Perfect regulation is the keynote to the whole SPLITDORF system, the controller parts incorporated in the generator answering for the output of the dynamo as well as the flow of the current to the battery at all times and under every condition.

Full descriptive matter sent upon request.

SPLITDORF ELECTRICAL COMPANY

Factory: NEWARK, NEW JERSEY

The SAXON Car

$395
f. o. b. Detroit

The price of $395 includes lamps, top, adjustable windshield, baggage box, tools and tire kit.

A high-grade, well-designed, carefully-built, small automobile, with four-cylinder motor, standard tread, standard features—produced by an experienced organization soundly financed and well managed.

Everybody in the motor trade realizes that the small car, so popular in Europe, is the coming thing in America. In the Saxon, at $395, we offer you the first genuine small automobile at a price within the reach of everyone.

The organization back of this car is a guarantee of the car itself, of the business policy that will be pursued with dealers and customers, of the ability of the company to turn out cars in large numbers and of assured quality.

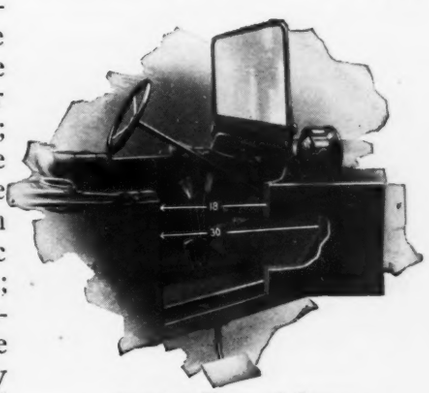
Good—and Good-looking

The Saxon meets the demand for a low priced car that is not only good, but good-looking. It is a big car for the price, with 96-inch wheelbase, roomy body, ample leg room, generous doors. There is nothing skimpy or cramped about it. Molded oval fenders, tapered bonnet, streamline body, graceful, sweeping curves make this car a delight to the eye.

The Saxon is amply powered. The high-speed, four-cylinder motor (2⅝" bore x 4" stroke) with large gear reduction in the rear axle, gives great pulling power and great flexibility. The car lugs along wonderfully well through mud and on hills. It throttles down to five miles an hour or speeds over the road at 40—and without unpleasant vibration or jarring.

Standard Features Throughout

Standard motor car practice has been followed in all the essential features of the car. The four-cylinder engine; the progressive sliding gear transmission; the dry plate clutch; the shaft drive with concentric torque tube; the semi-floating rear axle with sturdy pressed steel housing; the drop-forged,



Interior View of Saxon

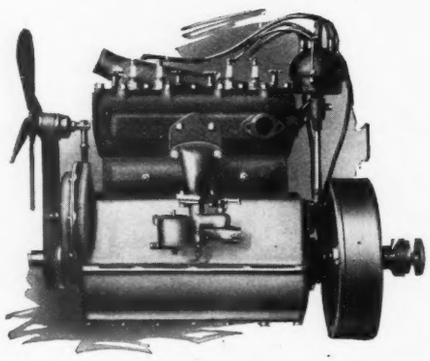
The open door, 18" wide, is cut away to show the ample leg room, 30". Control levers, pedals, steering wheel and horn are shown.

The SAXON Car Is

heat-treated I-beam front axle; the standard type of steering gear.

In all these features the Saxon uses the same type of construction as is used in cars costing all the way from $1000 to $3000. The materials in this car are of thoroughly high grade.

In fact, the specifications for metal used in the frame, springs, body, motor, axles, and various forgings throughout are identical with the specifications for material in $2000 cars.



SAXON MOTOR—LEFT SIDE

Showing cylinder block and crank case cast integral, enclosed valves, intake and exhaust manifold cast integral, carburetor and Atwater-Kent distributor.

constructed that cylinders and crank case are cast all in one piece. Wherever possible one part has been made to do the work of two or three—thus saving material, cutting down labor cost and securing lightness. Drop forgings have been used instead of castings and machined parts. Transmission and axle are built as a unit, saving material and labor. The body, the floor and the luggage box have been formed of steel stampings. The entire subframe and sod pan under the motor have been formed from one large steel stamping. The water pump has been eliminated by the thermo-syphon system.

Two Reasons for Price

There are two principal reasons why we can offer you such a car as the Saxon at the price. First, the car has been designed from the very beginning with the idea of **building** it **economically.**

Second, on account of our connection and the organization back of the car, we are able to purchase materials and utilize them to the best advantage.

$395

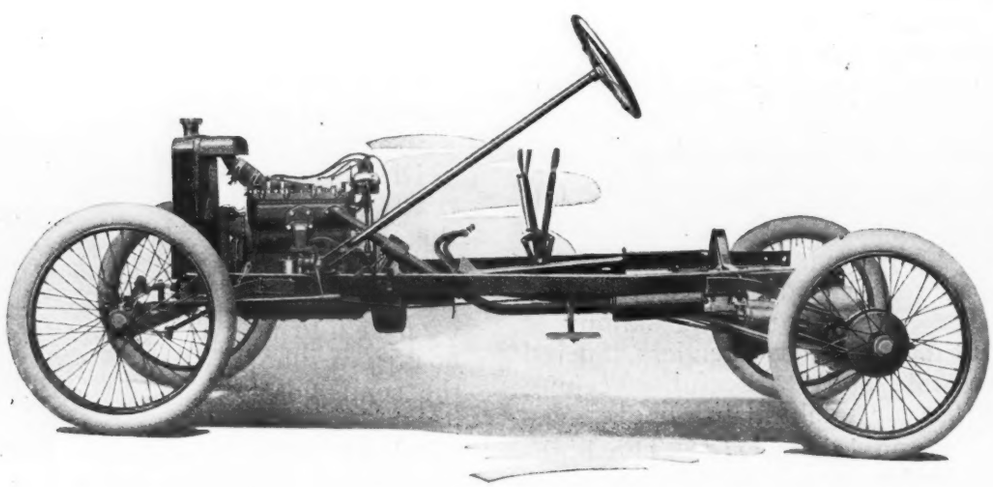
f. o. b. Detroit

Saxon engineers have done something absolutely remarkable in the way of designing a car of thoroughly high quality for economical manufacture. For example, the motor is so

Simplicity of Design

The car is so designed that it is simple to make and simple to put together, thus reducing the labor cost of assembling. All these savings have made possible the unexampled price and the extraordinary quality of the Saxon.

As you read the following description of the Saxon, please note how careful designing has helped to make it possible to produce such a car at the price.



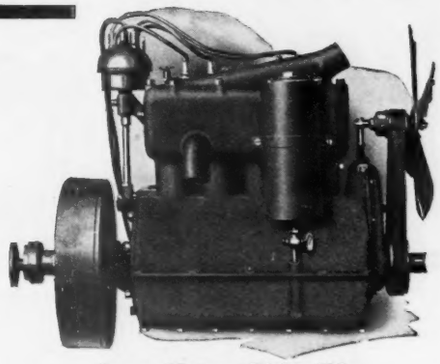
Chassis of Saxon—Side View

a Good Small Car

Mechanical Description of the Saxon Car

Motor

The Saxon motor car is exceptionally clean-cut and business-like in appearance. It is of the "L"-head type with fully enclosed valves. Cylinders are 2⅝" bore x 4" stroke. A water-jacketed head, fitting over the entire cylinder block, is easily removable and gives ready access to the cylinders and valves.



Saxon Motor—Right Side

Of strictly Saxon design and Continental make Note large oil reservoir, fan, large water inlet and outlet

Pistons and connecting rod are very light, but exceptionally strong. This lightness in the reciprocating parts makes this motor practically free from vibration.

The motor is lubricated by a new and very effective method called the Vacuum Splash oiling system. Oil is circulated and held at a constant level without a single moving part, thus securing utmost simplicity and economy through the elimination of the oil pump and its connections.

The carburetor is of specially designed Mayer make, very simple and very efficient.

$395

f. o. b. Detroit

Ignition

Ignition is supplied by the Atwater-Kent system with six dry cells. Experience has shown that these six dry cells will last for the entire season without renewal. Replacement, when necessary, is very inexpensive.

Transmission

The sliding gear progressive type transmission gives two forward speeds and reverse. The use of this type of transmission and its location on the rear axle eliminate a number of pieces in the shifting mechanism—another feature of design making for economy in the building of the car.

Clutch

The clutch is asbestos-lined, dry plate, 5-disc type, very similar to the clutch used on some of the highest priced cars. Insofar as smooth action and long life are concerned, it is fully equal to the clutch used in large cars, and at the same time contains less than half the usual number of pieces.

Axles

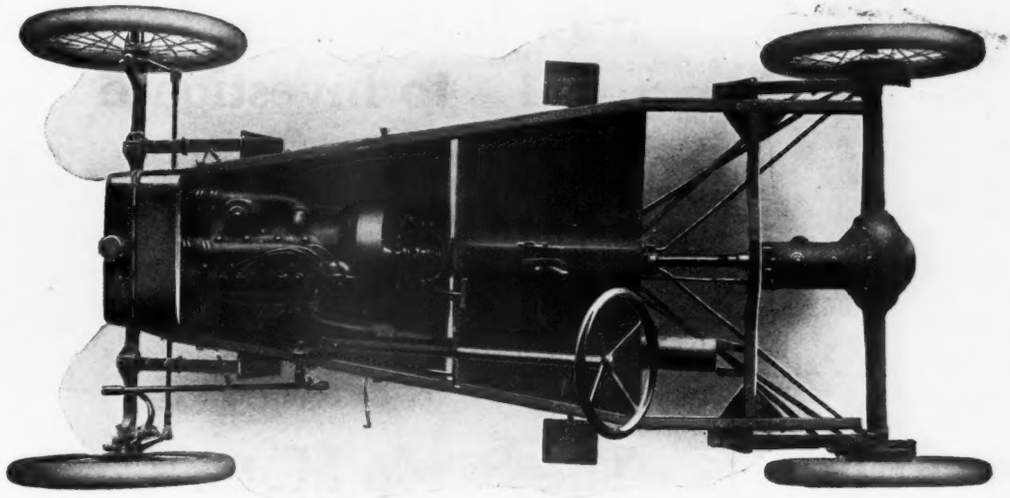
The Saxon axles, both front and rear, are of the same type of construction as used on large cars selling from $2000 up. The front axle is a single piece drop forging, I-beam section. The rear axle is of the semi-floating type, with pressed steel housing.

Control

The Saxon car has the modern left-hand drive with gear shift and emergency brake levers in the center, permitting entrance from either side of the car. The clutch and service brakes are controlled by separate pedals, placed in a convenient position. The throttle is controlled entirely by the foot accelerator, which is so constructed and situated that it does not tire the foot. The spark lever is on the dash, thus leaving the 16-inch steering wheel entirely free from levers.

Wheels

The wire wheels add greatly to the up-to-date appearance of the Saxon. They are 28" in diameter, with 28" x 3" clincher tires.

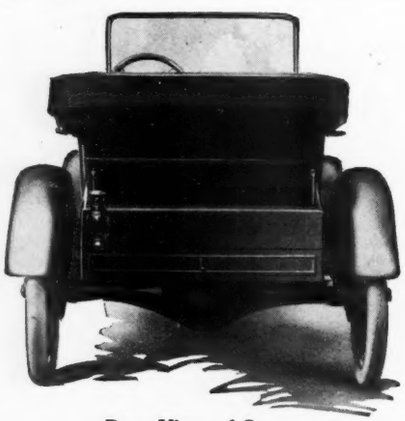


Chassis of Saxon—Top View

The SAXON Car

Specifications of Saxon Car

Front Axle—Single-piece drop forging, I-beam section, heat treated. Ball bearings in hub.
Rear Axle—Semi-floating. Pressed steel housing. Outer end of drive shaft carried on Hyatt roller bearing. Differential—two pinion, plain bearing.
Brakes—Two sets of brakes on rear wheels. Service brake 8" diam. lined with heat-proof material. Emergency brake steel on steel 7 11/16" diam. Both brakes 1¼" face.
Body—Streamline, two-passenger. Seat 16" deep, 40" wide, 30" from heel board to dash. 18" door.
Control—Left-hand steer. Center control. Throttle control by foot accelerator, spark control on dash.
Transmission—Sliding gear, progressive type, two speeds forward, one reverse. Transmission mounted on rear axle. Hyatt roller bearings on main drive shaft of transmission. Other bearings hardened steel on cast iron.
Drive—Shaft drive, one universal joint, concentric torque tube.
Clutch—Dry plate, five plate, steel on wire woven asbestos.
Frame—Channel section pressed steel 3" x 1¼" x ⅛".
Fuel—Gravity feed from 6 gal. gasoline tank, located under cowl.
Ignition—Atwater-Kent, 6 dry cells.
Tread—Standard.
Wheel Base—96".
Tires—28" x 3" clincher.
Wheels—28", wire spokes.
Steering Gear—Bevel gear type, sector and pinion, 1¼" diam. steel tube post, 16" wheel. Drop forged steering connections.
Horse Power—15.
Motor—L-head, four cylinders cast en bloc, crank case integral, 2⅝" bore, 4" stroke.
Valves—Nickel steel head with carbon steel stem. 1 3/16" diam. ¾" lift.
Cam Shaft—Drop forged special steel, diam. 1", cams integral, driven by helical gears, two bearings.
Crank Shaft—Special drop forged steel, two bearings, front 1¾" diam. x 2"; rear 1¾" diam. x 3". Crank bearings 1¾" diam. x 1½".
Connecting Rods—Drop forged steel, I-beam section, 8" centers.
Crank Shaft Bearings—Bronze, babbitt-lined.
Oiling System—Vacuum feed. Splash distribution.
Cooling—Thermo-syphon, cellular type radiator, fan.
Springs—Cantilever type, front 22" long, 1½" wide; rear 23" long, 1½" wide; main leaf vanadium steel.
Equipment—Top, windshield, two gas head lights, oil tail light, gas generator and bulb horn.



Rear View of Saxon

Showing baggage box with top raised, oval fenders, rear axle with trussed pressed-steel housing

$395

f. o. b. Detroit

Saxon Motor Car—with Top Up

Note the tapered bonnet, streamline body, oval fenders, wire wheels, left drive, adjustable windshield and general trim appearance

Special Saxon Features:

Good Looks
The first handsome small car.

Left Drive; Center Control
Permits entrance from either side.

Great Flexibility
High speed, long stroke motor gives 5 to 40 miles per hour on high gear.

Ample Power
High speed motor, with large axle reduction, gives great pulling power.

Low Cost of Upkeep
Twenty-five miles or better per gallon of gasoline; 100 miles per pint of oil; low tire cost on account of light weight.

Vacuum Splash Oiling System
Efficient, economical, simple, no moving parts.

Freedom from Vibration
Pistons and other reciprocating parts well balanced, light but strong.

Cantilever Spring Suspension
Gives this car, with 96-inch wheel base and 28-inch wheels, the riding comfort of larger cars.

Streamline Body
Handsome, stylish, up-to-date.

Molded Oval Fenders
Distinctive appearance; thorough protection.

Lots of Room
Wide, comfortable seat; ample leg room.

Wire Wheels
Light, strong, stylish, easy on tires.

Sliding Gear Transmission
Progressive type, used on many higher priced cars.

Multiple Disc Clutch
Dry plate type, asbestos-faced.

Large Carrying Compartment

Adjustable Ventilating Windshield

Vanadium Steel
Used in many parts.

Now Is the Time for Dealers to Investigate

For a car like the Saxon there is an unlimited market. Many thousands of people who have not been able to afford cars at former prices are ready and waiting to buy a car like this one. The field is almost unlimited.

Territory is rapidly being allotted. Perhaps yours is open. Write or wire if you want to get in on this money-making proposition.

Please send literature regarding Saxon Motor Car.

Name .....

Street .....

City..... State.....

If you are a dealer, please state what cars you handle and what territory you cover.

The Saxon Motor Company

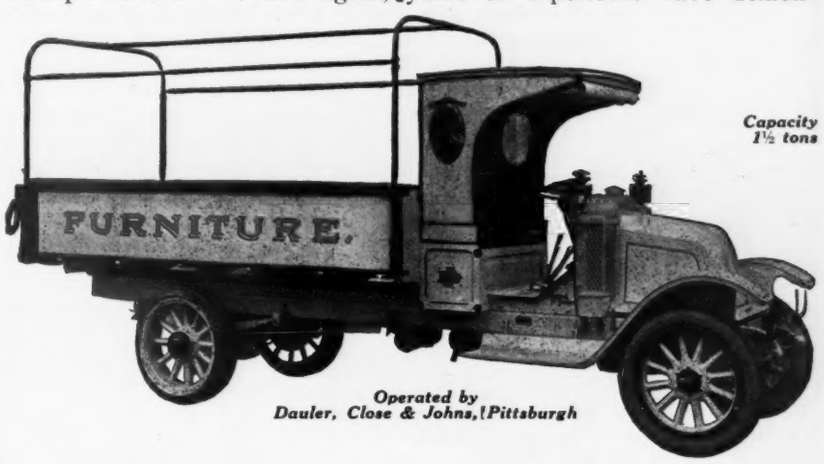
Detroit, Michigan

Silent **Lippard-Stewart** Powerful

Trucks That Meet the Demand

"How am I to know why this truck or that is better than another?"

Not long ago this question was a common one, but at that time motor transportation was new and trucks of a diversity of types were untried. Then the purchase of commercial cars was largely a matter of confidence. But times have changed. Owners have been watching truck development. They have found out what amount of work a car can reasonably be expected to do under certain conditions. And, what is more, they now make it their business to know the relation of the type of truck, capacity and mechanism considered, to the service expected of it. In other words, **they know what they want.**

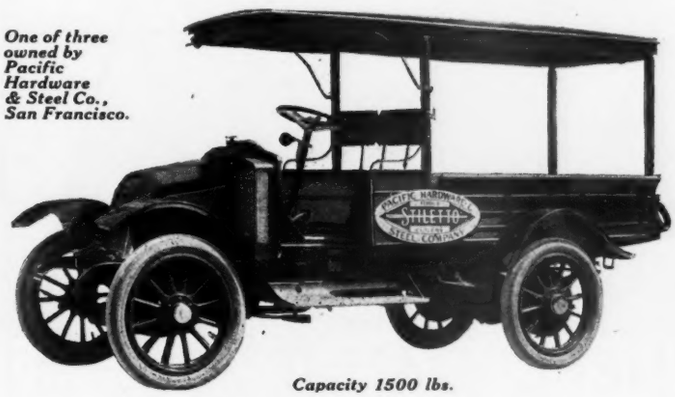


Capacity 1½ tons

Operated by Dauler, Close & Johns, Pittsburgh

In a Lippard-Stewart truck, this public demand is given the credit it deserves, because its designers have their ears to the ground—quick to heed the trend of the times. For instance, the shortcomings of chain drive, the uncertainty and annoyance which it involves, its excessive wear and waste of power, opened the eyes of users to the advantages of the worm and gear, the success of which has long since been proved in the hardest service—London omnibuses for example. Now, in the Lippard-Stewart, the solution of former drawbacks is offered to American users in a rear axle of the highest quality **—Timken-David Brown Worm-Drive.**

Then again, years of experience have demonstrated that no longer can a touring car chassis answer for a truck. Commercial vehicles require simplicity, reserve power, and much greater strength. Truck users want the smoothness, pulling power, and the low gasoline consumption of the long stroke motor, common-sense automatic speed regulation, security and efficiency of the radiator, the choice of solid or pneumatic tires to suit conditions, the utmost safety—and in each essential the **Lippard-Stewart measures up to the standard.**



One of three owned by Pacific Hardware & Steel Co., San Francisco.

Capacity 1500 lbs.

And so we might enumerate instance after instance. But the one point that investigation of Lippard-Stewart trucks makes evident is this: every separate part, every complete unit, every principle of design, embodied in their make-up carries with it the stamp of modern practice—the approval created by the highest type of service and voiced by popular demand.

Lippard-Stewart trucks are furnished in two capacities: 1½ ton chassis, worm-drive, $2300; 1500 lb. chassis, bevel-drive (pneumatic tires) $1650, worm-drive (solid tires), $100 extra. Bodies for various purposes.

Lippard-Stewart Motor Car Co., 1730 Elmwood Avenue **Buffalo, N.Y.**

DON'T GUESS

TIRES inflated to forty pounds look and feel exactly like tires containing eighty. The only way to tell the air pressure in your tires is by means of a

NEW POSITIVE LOCK-STOP

TWITCHELL

AIR GAUGE

Insist upon getting the NEW Twitchell. It possesses a positive lock stop feature that renders absolutely impossible the registration of any but the exact air pressure in your tires. This construction permits the use of the gauge no matter in what position the tire valve rests. You no longer have to turn the wheel around until the valve is at the bottom. Another improvement to be found in the NEW Twitchell is the lengthened base which permits of an air-tight connection being made with the valve no matter how small the space between the rim and hub. The NEW Twitchell is accurate, simple, durable, easily applied and easily read.

PRICE ONE DOLLAR

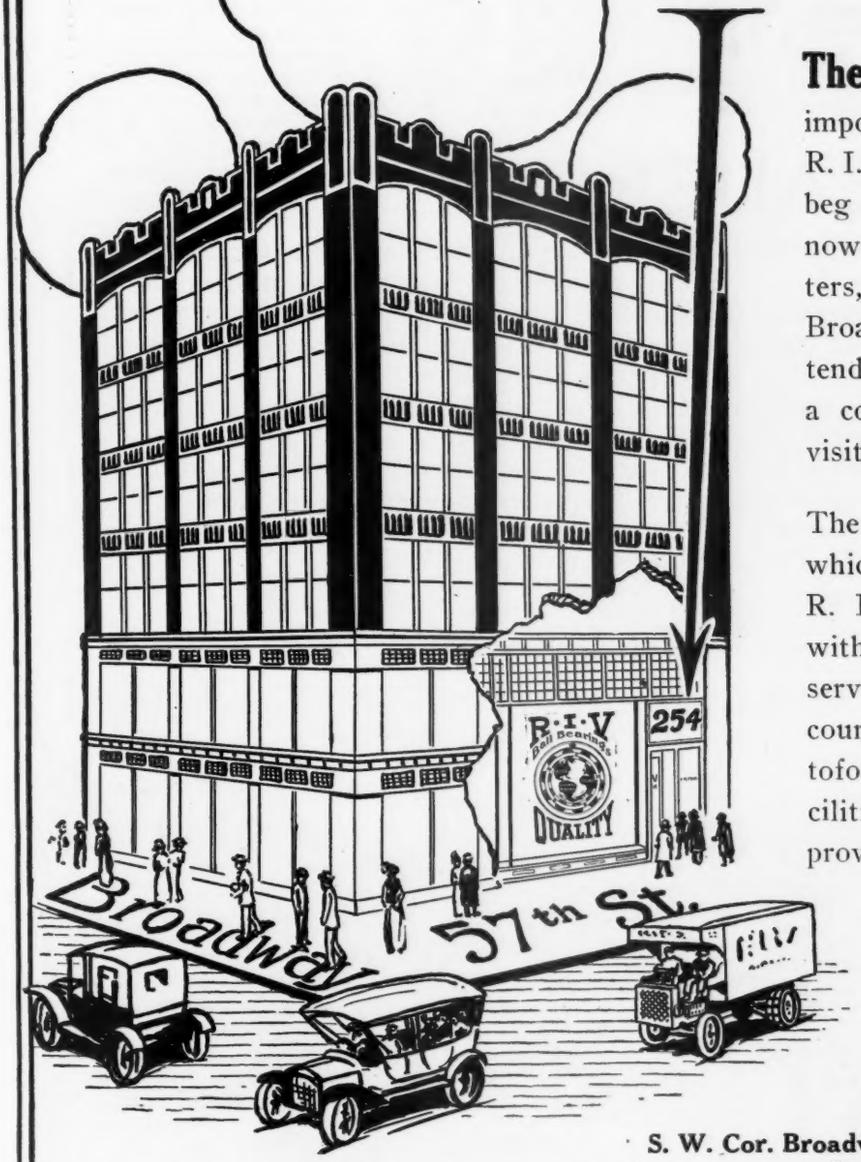
TWITCHELL GAUGE CO.

1201 MICHIGAN AVENUE, CHICAGO

R.I.V.

Ball Bearings

Our New Location



The R. I. V. Company, importers of the well known R. I. V. Quality Ball Bearings, beg to announce that they are now settled in their new quarters, **254 West 57th St.** (cor. Broadway), and herewith extend to friends and customers a cordial invitation to pay a visit of inspection.

The attention and service which have always marked the R. I. V. Company's dealings with customers will be observed with the same degree of courtesy and efficiency as heretofore, while the increased facilities of their new home provide advantages which users of the "Here, There and Everywhere" Ball Bearings cannot fail to profit by.

R. I. V. Company

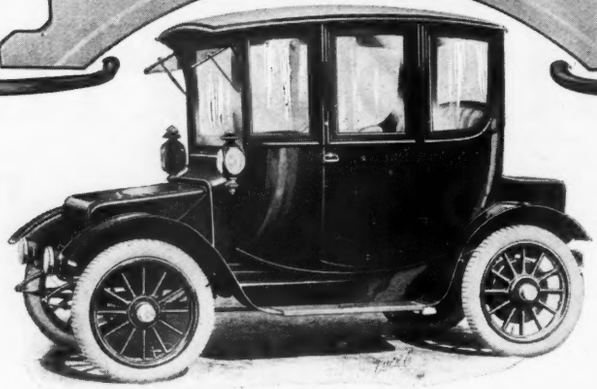
S. W. Cor. Broadway & 57th Street, New York

Imported Since 1904

WE HAVE BEEN COACH BUILDERS OVER SIXTY YEARS

Rauch & Lang Electrics

WORM DRIVE



Every Rauch & Lang Electric Car

presents a quiet richness of design and finish that outrivals that of any monarch's conveyance, whether the exquisite Sedan Chair of a Marie Antoinette or the imposing state coaches of present-day rulers.

Three Types of Control—Front, Rear, Selective Dual

Select the position from which you desire to drive according to the number of passengers. Controls and brakes are automatically interlocked by merely turning front seat to natural position required by driving conditions.

LEADERSHIP

To hold for 60 years the recognized supremacy in all vehicle construction—

To initiate new standards in engineering, design, mechanical perfection, and luxury of appointment in each successive era—

To possess the ability to combine these in master-productions that embody the genius of the artist and the skill of the finished craftsman—

This is efficiency; this is true leadership—the factors that make the Rauch & Lang Electric Society's Chosen Car.

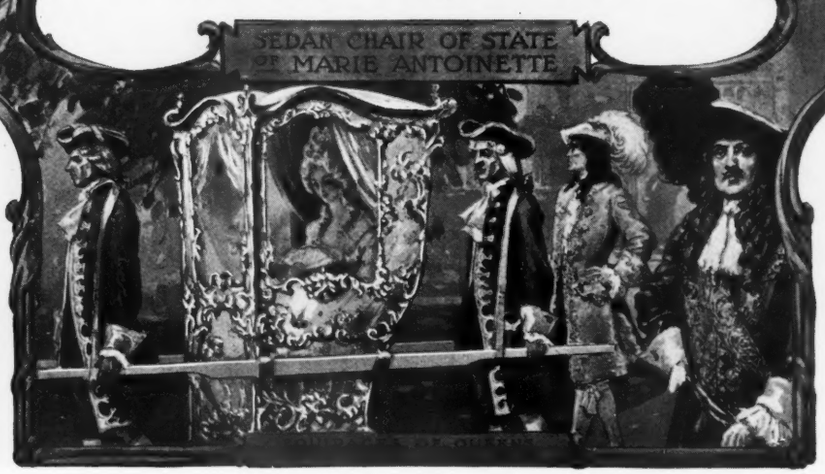
The latest Rauch & Lang introduces the famous Straight Type, Top-Mounted Worm Drive, guaranteeing reliability, maximum power efficiency with minimum cost of upkeep—no adjustments required. A car of wonderful silence.

Rauch & Lang agents in all large cities will gladly demonstrate.

Seating, Controlling, Braking and Top-Mounted Worm-Drive features are exclusive with Rauch & Lang cars, and, as well as the design of the car and other details of construction, are fully covered by United States patents pending and granted.

THE RAUCH & LANG CARRIAGE COMPANY, 2221 W. 25th Street, Cleveland Sixth City

BRANCHES: New York, 1800 Broadway; Minneapolis, 1207 Harmon Place; Kansas City, 3501 Main Street



Turkish Room, Waldorf-Astoria

Rauch & Lang cars will be exhibited in the Turkish Room of the Waldorf - Astoria Hotel during the Grand Central Palace Show.

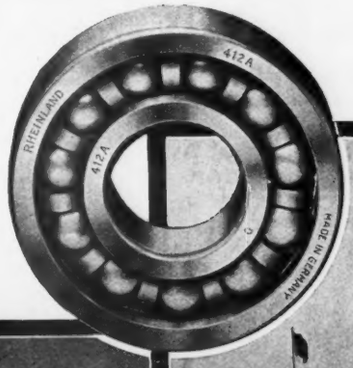
Grand Central Palace Show

And also on exhibition in the Electric Vehicle Section at the Grand Central Palace Show.

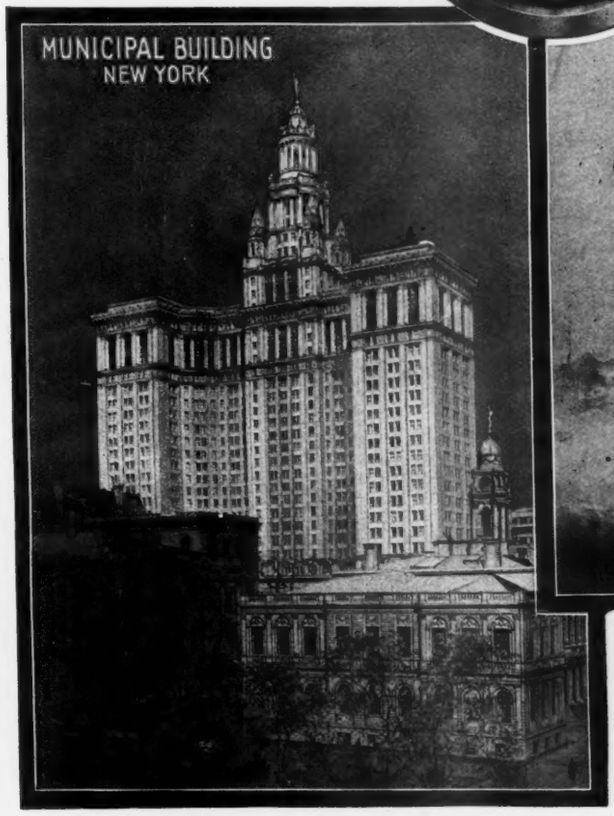
RHINELAND
BALL BEARINGS

INSURANCE FOR BUILDER AND USER

Bearings which fulfill the requirements of Herculean undertakings such as these improve the efficiency of the finest machine or automobile.



Elevators in this building are equipped with Rhineland Ball Bearings.



And Rhineland Ball Bearings are used in the machinery of the Imperator.

RHINELAND MACHINE WORKS COMPANY

140 WEST 42nd STREET **NEW YORK**

Agencies and Supply Depots in Principal Manufacturing Cities

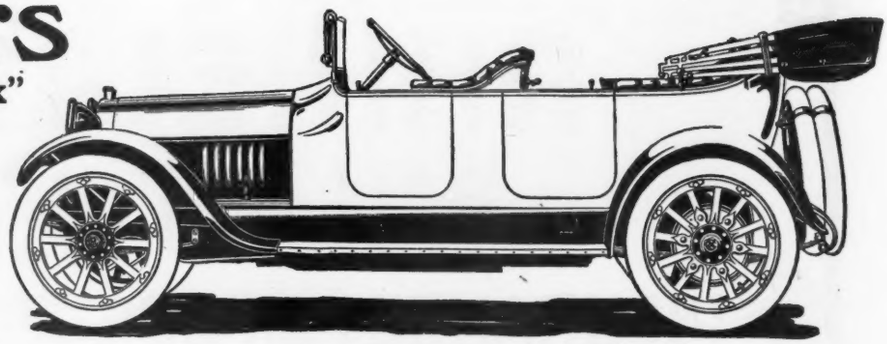
Chalmers

The Master "Six"

$2175

Fully equipped f. o. b. Detroit

See It At The Shows



5-PASSENGER TOURING CAR

Cars that Satisfy—in looks, performance and price

People used to the very best in motor cars, people who want quality, distinctive beauty, and excellence of mechanical design and construction, and who have this year bought the Chalmers Master "Six"—tell us that no other car on the market combines, in such abundant measure, the qualities of up-to-date style and beauty, with long-lasting strength and economy of operation.

In every detail, the Chalmers "Six" is of finest materials and workmanship. It ranks with the most expensive cars, yet sells at a popular price.

Quality Not Limited by Price

Here is "the car unusual," the car unlike most others, in that its fineness, its top-notch quality, is not attended by high price. Chalmers quantity production in its own shops has made possible this car of finest quality at a moderate price.

A careful comparison, point by point, with other cars, will satisfy the most skeptical that the wonderful value of the Chalmers "Six" is not exaggerated. Compare wheelbase, motor starting and lighting systems, body lines, control systems, roominess and luxury of appointments and finish—you can't find greater mechanical excellence, more beauty, power, or comfort, no matter what priced cars you look at.

Surpassingly Good to Ride In

Did you ever ride in a really fine six-cylinder car? If so, you will appreciate the Chalmers ride which we ask you to take. If not, you have a treat in store, for it's a wonderful pleasure to ride in these deep, springy seats, behind the soft-pulling Chalmers motor; to be cushioned along on Chalmers springs and kept safe by the starter that won't let the motor stop, under even the most trying conditions.

A Handsome Car

Just as you're more comfortable in a well-fitting suit, you'll enjoy the Chalmers "Six" because of its grace and beauty, its up-to-dateness and style. Yachtlike body lines, gently sloping hood, molded oval fenders, running boards entirely clear—all mouldings eliminated—these points mark the Master "Six" as a car of advanced design. They make it a car fit for the society of Best "Sixes."

See the Chalmers models at the Motor Shows. We will help you examine them carefully and make clear any points you wish to know. Arrange for the Chalmers Standard Road Test, the ride that proves our claims beyond a doubt.

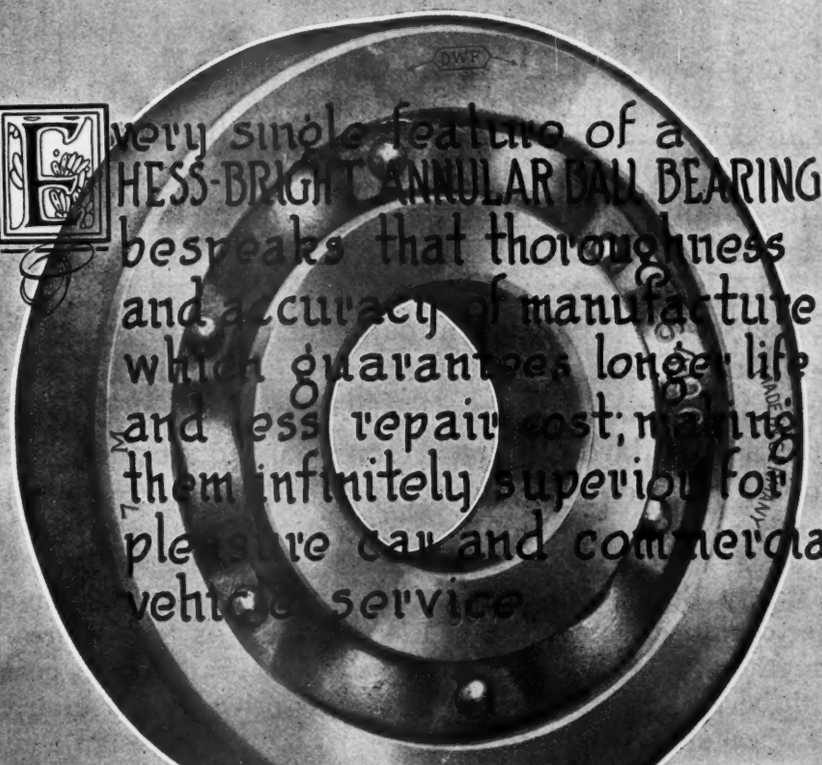
Chalmers Motor Company, Detroit

HB Hess-Bright D.W.F.

HESS-BRIGHT

HB DWF

BALL BEARINGS



Every single feature of a HESS-BRIGHT ANNULAR BALL BEARING bespeaks that thoroughness and accuracy of manufacture which guarantees longer life and less repair cost; making them infinitely superior for pleasure car and commercial vehicle service.

The HESS-BRIGHT MANUFACTURING CO.
FRONT ST AND [illegible] PHILADELPHIA PA.
STORES FOR RETAIL DISTRIBUTION
Philadelphia 666 N. Broad St - New York 1974 Broadway - Chicago 1800 Michigan Ave.

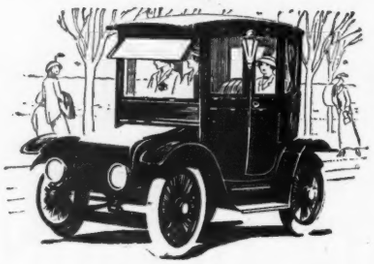
Baker Electrics

QUALITY SERVICE

New York Show

January 3rd -- 10th

Baker Electrics will be exhibited at the Grand Central Palace — Electric Vehicle Section — Second Floor.



Chicago Show

January 24th--31st

Baker Electrics will be exhibited at the First Regiment Armory—Electric Vehicle Section—Space A-2.

The Stability of the Manufacturer Behind the Car

There has never been a time in the whole history of automobile development when the dealer should investigate with greater care the claims of the manufacturer whom he is to represent. We suggest that you INVESTIGATE.

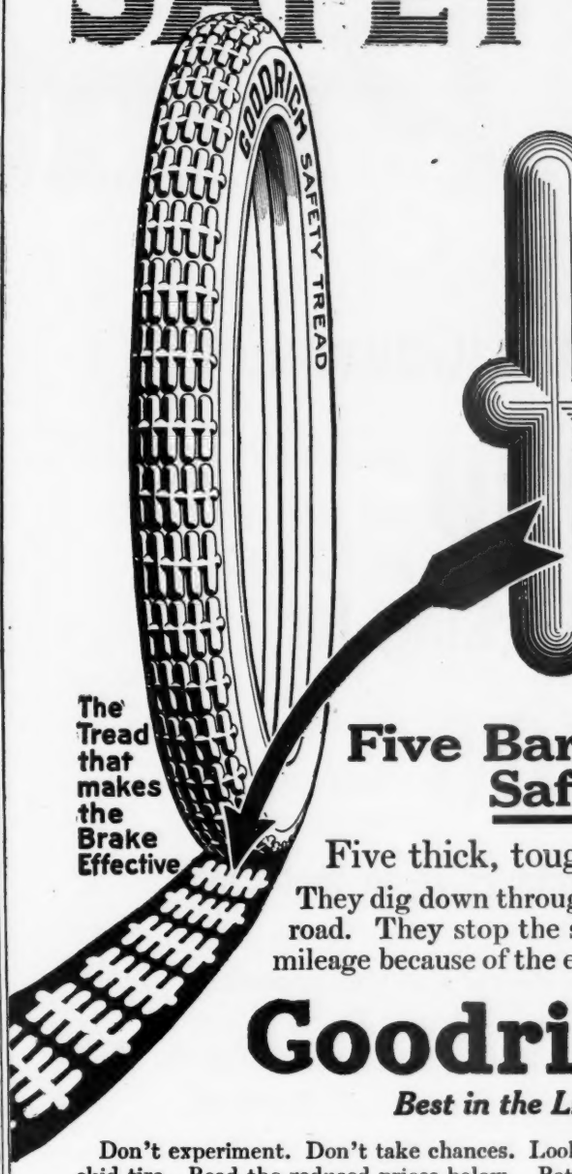
The Baker Motor Vehicle Company has been in business longer than any other electric automobile manufacturer. Its success has been unbroken from the start. Its product is everywhere accepted as standard. After fifteen years' continuous operation it enjoys a position of security and leadership attained by very few in the entire automobile industry.

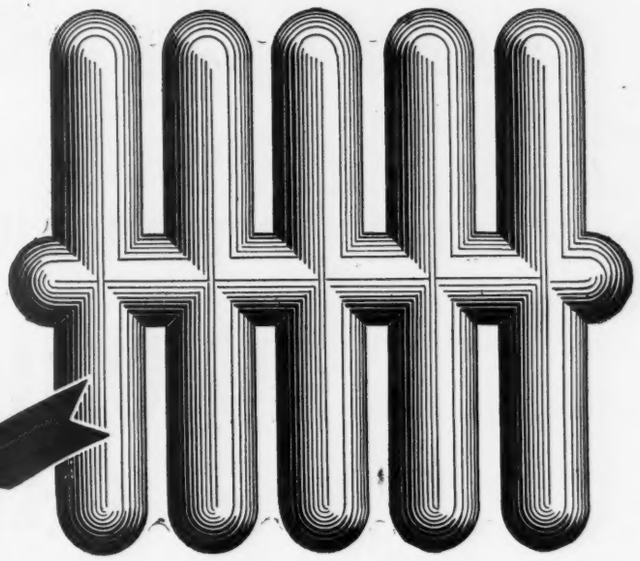
Three stately Broughams, a beautiful new Coupe and a clean-cut, racy Roadster comprise the new Baker Electric line. As for features you can offer anything that is desirable — shaft drive with worm gear in one car; with bevel in another; front drive, rear drive or double drive; lever steer or wheel steer, combined with unusual beauty of design and a structural superiority conceded the country over.

Write for Descriptive Matter and Detailed Information.

The Baker Motor Vehicle Company, Cleveland

SAFETY FIRST





Five Bars and a Cross Tie—the Safety First Symbol

Five thick, tough Goodrich rubber fingers—

They dig down through mud, slush and ooze; they clean and grip the road. They stop the skid before it starts. They give you lower-cost mileage because of the extra thickness of rubber at the point of contact.

Goodrich Safety Tread Tires

Best in the Long Run—Best in the Short Stop

Don't experiment. Don't take chances. Look for the five bars and the cross-tie when you choose a non-skid tire. Read the reduced prices below. Better still, tear out this price list and hand it to your dealer.

Don't pay more than the prices named here for the accepted *standard* non-skid tires:

Size	Smooth Tread Prices	Safety Tread Prices	Size	Smooth Tread Prices	Safety Tread Prices
30 x 3 - -	$11.70	$12.65	34 x 4½ - -	$33.00	$35.00
30 x 3½ - -	15.75	17.00	35 x 4½ - -	34.00	36.05
32 x 3½ - -	16.75	18.10	36 x 4½ - -	35.00	37.10
33 x 4 - -	23.55	25.25	37 x 5 - -	41.95	44.45
34 x 4 - -	24.35	26.05	38 x 5½ - -	54.00	57.30

Dealers almost everywhere have Goodrich Tires in stock or can get them for you from one of our branches or depots.

Factories: AKRON, OHIO

The B. F. Goodrich Company

Branches in All Principal Cities

There is nothing in Goodrich Advertising that isn't in Goodrich Goods

Motor Print

Present Circulation Guarantee

40,000

but We are Working for

50,000

all paid in advance—all interested in motoring

We want to interest more car owners in this monthly journal of recognized excellence. Motor Print is not a technical journal, but has a direct and impelling interest appeal for those who enjoy the social phases of motoring, and are interested in motoring styles, motoring progress and tendencies.

Motor Print is published monthly. Single copies, ten cents. One dollar the year. Tear this page, attach a dollar bill, enclose it in an envelope, and address:

MOTOR PRINT COMPANY
418-20-22 Sansom Street, Philadelphia, Pa.

J-M AUTOMOBILE ACCESSORIES

Backed by the Guarantee of a $5,000,000 Concern

J-M (Mezger) Soot-Proof Spark Plug

The only plug that can not short-circuit—because it is the only plug that is absolutely soot proof. Porcelain insulation becomes so hot at firing point that carbon is burned up the instant it settles.

Over 12 years on the market. Millions in use.

J-M Dry Batteries
(Guaranteed)

If J-M Dry Batteries do not prove satisfactory, we will supply new batteries without cost.

This guarantee is the most convincing argument we can possibly offer to prove the high standard of J-M Dry Batteries for ignition work.

Made in three capacities: 20, 30 and 35 amperes, 1½ volts per cell.

J-M Mobilite Electric Lamps
Operated on Dry Batteries

For head, dash, tail and speedometer lights, and interior car illumination. Also for motorcycles, motor boats, camps, bungalows, etc.

Made of hard rubber, fitted with a Tungsten bulb, a powerful lens and reflector. Six 30-ampere, J-M Dry Batteries will operate a set of four lamps from 300 to 420 hours.

Jones Speedometer

Most accurate speedometer made. Operates on the centrifugal principle, therefore is not affected by atmospheric changes.

Strongest in construction. Has fewest number of parts. Not affected by jars or bumps. Big speed figures—steady hand—clock dial. Trip and season odometer. Instantaneous trip reset.

J-M Non-Burn Brake Lining
GIVES PERFECT CONTROL OF CAR

Grips the drum the instant brakes are applied. Never slips. Unaffected by frictional heat, oils, water, grit, etc., because it is made of pure asbestos fiber interwoven with strong brass wire.

Long Horn

This mechanical horn never fails. It is not dependent on batteries, motor, bulb, wires or anything else that can possibly break or get out of order. Costs nothing to operate or keep in repair.

Made in various styles for all purposes.

Write our nearest Branch for illustrated booklets fully describing these goods.

See Our Exhibit at the New York Auto Show, Space D-3, Fourth Floor

H. W. JOHNS-MANVILLE COMPANY

Manufacturers of Brake Lining, Spark Plugs, Electric Lamps, Speedometers, Electric Horns, Fire Extinguishers, Dry Batteries, Fuses, Tapes, Packings, Etc.

Akron	Boston	Cleveland	Detroit	Indianapolis	Milwaukee	Omaha	St. Louis	Syracuse
Albany	Buffalo	Columbus	Duluth	Kansas City	Minneapolis	Philadelphia	St. Paul	Toledo
Atlanta	Charlotte	Dallas	Galveston	Los Angeles	Newark, N. J.	Pittsburgh	Salt Lake City	Washington
Baltimore	Chicago	Dayton	Houghton	Louisville	New Orleans	Portland, Ore.	San Francisco	Wilkes-Barre
Birmingham	Cincinnati	Denver	Houston	Memphis	New York	Rochester	Seattle	Youngstown

THE CANADIAN H. W. JOHNS-MANVILLE CO., LIMITED. Toronto Montreal Winnipeg Vancouver

2260

THE NATIONAL AUTO SHOW

Under Auspices of Automobile Chamber of Commerce, Inc.

At CHICAGO

Coliseum

and

1st Regiment Armory

January 24—31

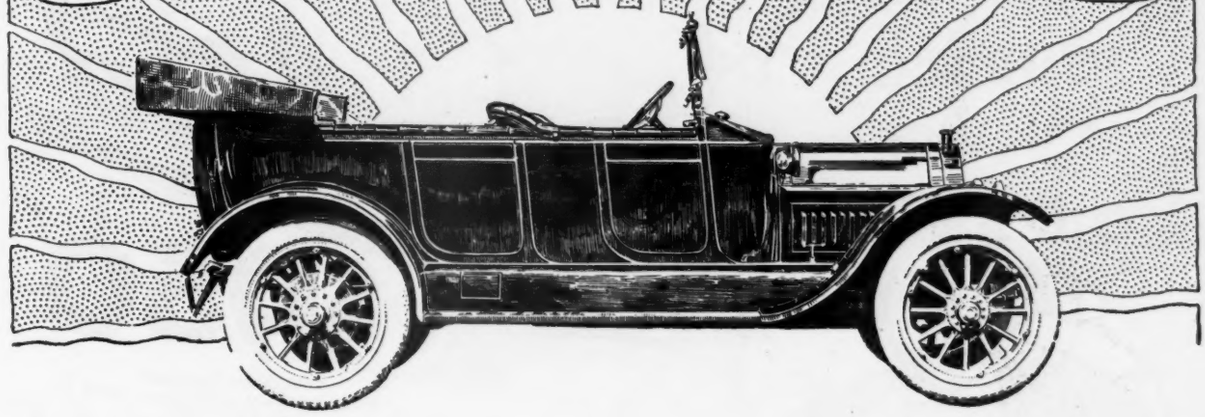
Passenger Vehicles—Parts—Accessories

S. A. MILES, *Manager*

Auditorium Hotel, Chicago

Lyons-Knight

"The Car of Silence"



The Dawn of a New Era!

WITH the New Year of 1914 comes a new era in motordom. For twenty years the automobile has passed through the experimental stages in design—in materials—in methods of manufacture—in sales and in service. Now comes the Lyons-Knight as the first car of a new era. Because of its many better features it is important that you see and know its value before you buy **any** car. Here are reasons:

A Great Change for the Better

The automobile industry has worked toward this great change for years. The history of other automobile factories proves it. The million motorists of America have learned to know the features that go to make automobile value.

One group of men, backed by ample capital, foresaw this change. They secured one of the greatest manufacturing institutions of America. They brought to their organization the most experienced engineers and production managers. For two years they studied to produce the car to satisfy the experienced motorist. They designed and erected machinery to construct such a car. They anticipated the dawn of the new era.

The result is the Lyons-Knight—a car that is different and better than any other high class car.

This car is backed by a service—by a broad-gauge, business-like sales policy that has secured the finest dealers from the old days of the automobile.

This great, new, live, strong, aggressive organization ushers in the first car of the new era.

What the Lyons-Knight Proves

"The Car of Silence" is proof of this new era in automobile design, manufacture and value. One ride in it will convince you that its makers have produced something different and better.

The Lyons-Knight is no more a 1914 car than it is a 1918 car or a 1924 car. So staunchly and truly is it built that years of use but make its operation smoother and more efficient.

The lines of the bodies are such that this car will be a standard for years to come. Nothing radical this year or next—always pleasing and up-to-date.

The Lyons-Knight engine is the finest power plant ever placed in any American car. Its makers guarantee its performance to surpass that of any four-cylinder poppet-valve engine of equal size—to surpass a six-cylinder poppet-valve engine of larger size even in the points of smoothness and flexibility as well as power.

Worm drive brings to this big 130 inch wheel base car an added smoothness and balance—freedom from vibration and sounds the death note of the grinding gears which marked the finest cars of the old era.

Point after point adds to the proofs that this car is representative of a new order.

Before You Buy

You will find the great, growing, multiplying Lyons-Knight organization reaching out over the entire country. Its representative in your city is one of the most experienced men you can find. He will put you in touch with the new era in motordom that means greater value out of every dollar you invest.

Lyons-Knight cars will be on display at both the New York and Chicago Automobile Shows. Full information about the great organization and descriptions of the cars themselves will be mailed you on request.

Know about them—before you buy.

Ask for Catalog and Proofs

LYONS ATLAS COMPANY

INDIANAPOLIS, INDIANA

Lyons-Knight K-4 Five Passenger Touring Car - - - $2900

DEALERS: O'Connell's Garage, Bridgeport, Conn.; Johnson Motor Car Co., 455 Peachtree St., Atlanta, Ga.; Enterprise Auto Co., 407 Baronne St., New Orleans, La.; Louis Helm, Schenectady, N. Y.; A. M. Zimbrich, 21-29 Plymouth Ave., S. Rochester, N. Y.; Jas. K. Burton, 1211-13 Broadway, Nashville, Tenn.; J. H. Sarbecker, Black Earth, Wis.; Everson Motor Car Co., Brownsville, Tex.; The Ziegler Co., 1017 Michigan Ave., Chicago, Ill.; Hamilton Auto Co., N. 19th Ave. & E. Roy St., Seattle, Wash.; Knight Motor Car Co., 236 Avenue C, San Antonio, Tex.; S. R. Blocksom Motor Co., Philadelphia, Pa.; Fred W. Sewell, 1964 Broadway, New York, N. Y.; H. C. Wendel, 18 E. McMillan Ave., Cincinnati, O.; Standard Gas Engine Co., Bradford, Pa.; Geo. C. Brinkman Motor Car Co., 2818 Locust St., St. Louis, Mo.; The W. H. McIntyre Co., 305 10th St., Toledo, O.; E. H. Palmer, 57 Broad St., Charleston, S. C.; Worcester Motor Car Co., Worcester, Mass.

Lyons-Knight K-4 Seven Passenger Touring Car - - - $2980

SPECIFICATIONS

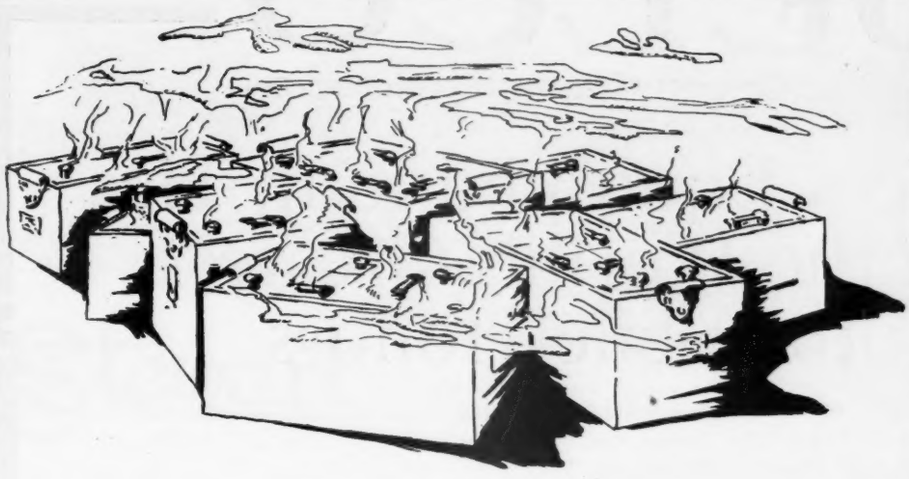
Electric head, side, tail and dash lights
Storage battery
35 Horsepower motor
114-inch wheelbase
33x4 Q. D. tires
Three-quarter floating rear axle
Timken and Hyatt bearings
Deep upholstery
Brewster green body
nickel and aluminum trimmings
Mohair top, curtains and boot
Clear-Vision windshield
Cowl dash
Stewart speedometer
Electric horn
Flush U doors with concealed hinges

TEN years ago you had to pay $600 for a two cylinder, eight horsepower Overland with a 72 inch wheelbase and a maximum speed of 30 miles—unequipped. Today $950 buys a four cylinder Overland of 35 horsepower, 114 inch wheelbase and a maximum speed of from 40 to 50 miles an hour. And the 1914 Overland comes completely equipped even to electric lights.

For catalogue please address Dept. 46.

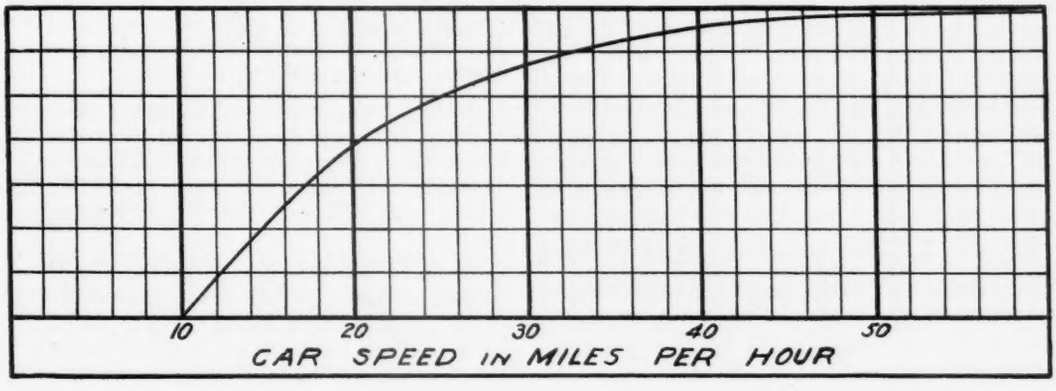
The Willys-Overland Company, Toledo, Ohio

Manufacturers of the famous Overland Delivery Wagons, Garford and Willys-Utility Trucks. Full information on request.



Burned Up Batteries and Dead Ones Are the Result

of using an Electric Generator with an output curve like this.



If you have to take your battery off to have it charged, you probably leave one like this.

On your next car, INSIST ON HAVING a

LEECE-NEVILLE
Starting & Lighting System

which charges at low speeds and was never known to burn out a battery at high speed. Ask the battery man or the car manufacturer who has used this system.

MANUFACTURED BY

The Leece-Neville Company

1051 Power Avenue, Cleveland, Ohio

(25)

DELCO

ELECTRIC CRANKING LIGHTING IGNITION

A Delco Equipped Car Has Won the World's Greatest Automobile Honors

An American motor car equipped with the Delco Electric Cranking, Lighting and Ignition System has been awarded the famous Dewar Trophy by the Royal Automobile Club of England.

The Delco system itself did not win this highly prized trophy, but it was so severely tested in the trials, and the record it made was so remarkable that some facts regarding it are bound to be of interest to motor car owners.

The trials that determined the award of the Dewar Trophy involved driving 1,000 miles over all sorts of roads at an average speed of 19.5 miles an hour. *This is somewhat misleading, however, as an exceptionally high rear axle gear ratio was used throughout the trial and the actual speed at which the electric generator was driven was the equivalent of only 13.2 miles per hour with a standard rear axle.*

During the entire trial, which lasted 66 hours and 17 minutes, or more than three days and two nights, all electric lights were burned continuously.

Actual driving time, however, was only 51 hours. For over 15 hours all lamps were burned while no current was being generated.

The cranking device was used 130 times; an average of once every 30 minutes during the entire 66 hours.

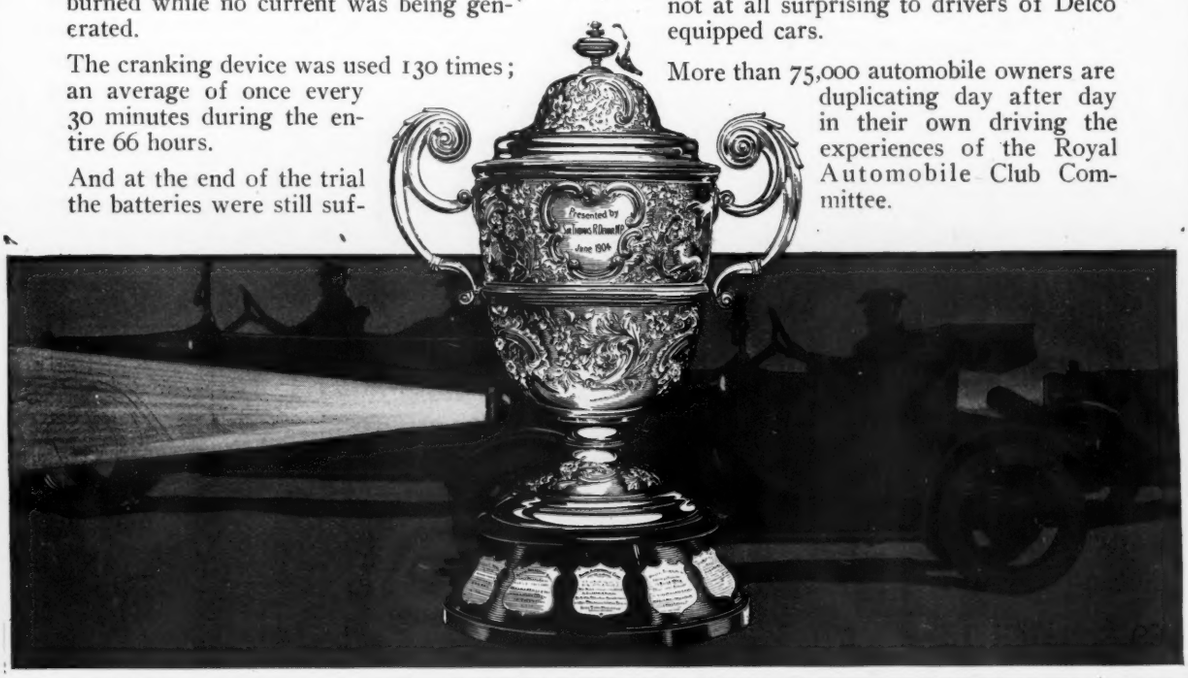
And at the end of the trial the batteries were still sufficiently charged to crank the engine 1,000 compressions and burn the side, tail and speedometer lights 20 additional hours.

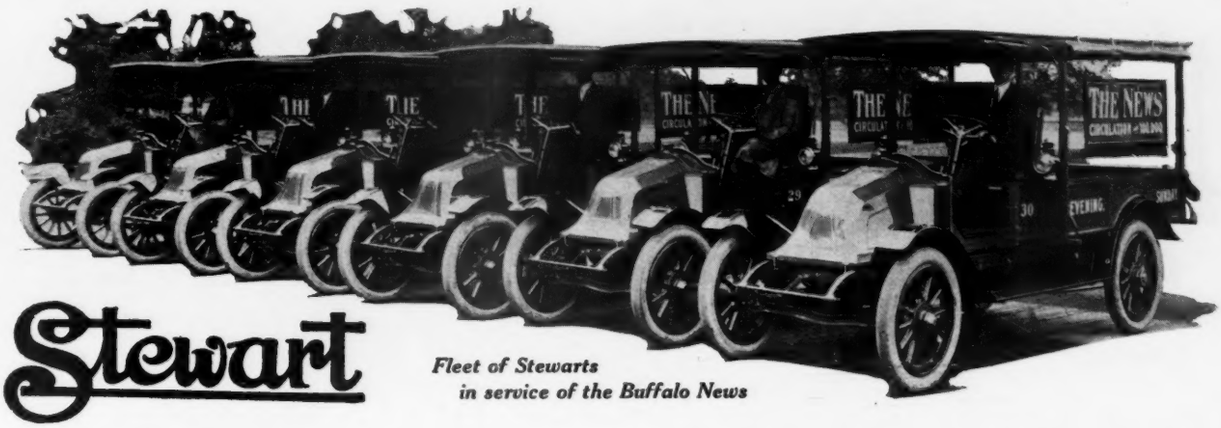
In other words, in spite of the heavy and continuous drain on the batteries for over 66 hours, while the generator was being run at unusually low speed for only 51 hours, the battery was still well charged at the end of the trial.

Another very gratifying phrase of the Committee's report is found in the statement that —"IT WAS OBSERVED AND NOTED THAT THE IGNITION WAS PERFECT THROUGHOUT THE TRIAL."

And yet while this entire performance of the Delco equipment is very wonderful, it is not at all surprising to drivers of Delco equipped cars.

More than 75,000 automobile owners are duplicating day after day in their own driving the experiences of the Royal Automobile Club Committee.





Stewart

Fleet of Stewarts in service of the Buffalo News

Why We Concentrate on One Model —A 1500-Pound Truck

Exclusively as a 1500-pound delivery truck, the Stewart is built. We build it in this carrying capacity for these essential reasons:

In the first place, a 1500-pound delivery truck has the widest possible range of usefulness and serves an almost unlimited field. The field for a heavier truck than 1500 pounds narrows down. For instance a five-ton truck has less than one-fifth the selling possibilities of the Stewart. And with a lighter truck than the Stewart the tendency of drivers is to overload and to wear out the vehicle quickly.

Thus, the Stewart is the ideal type of delivery truck for delivery purposes. It covers the ground quickly, dependably, economically. It can replace two horses at a lower hauling cost. It can do the work of four horses at less than one half the cost. Some Stewarts are supplanting as many as six horses.

Furthermore, we build the Stewart in 1500-pound capacity because we believe in concentration. The most successful concern in the pleasure car business today concentrates on one model, just as the builders of the Stewart do—on a type that reaches the widest possible field at the lowest possible cost. Like the builders of the Stewart, too, this concern is soundly financed and well managed.

This policy of concentration has been proven right by the test of experience. It pays the manufacturer; it pays the dealer; it pays the customer.

The Stewart sells for $1500. It is the truck that reaches the unlimited market. It is properly designed and well built by the largest exclusive manufacturers of 1500-pound trucks.

Write today and secure information about the dealer opportunity for your territory.

STEWART MOTOR CORPORATION

Buffalo, N.Y.

T. R. LIPPARD, Pres. and Gen'l Mgr. R. P. LENTZ, Sec. and Treas. R. G. STEWART, V. P. and Ch. Engineer

Receiver's Sale
Automobile Factory

THE property of the Amplex Motor Car Company of Mishawaka, Indiana, may now be bought at private sale, subject to the approval of the Judge of the St. Joseph County Circuit Court; or, in the event of no sale being made prior to January 20, 1914, the the property will be offered at public sale—as a whole, or in such parts as may be deemed expedient and not detrimental to a reasonable sale of the remainder.

Location	On L. S. & M. S. Main Line at Mishawaka, Indiana, with private switch to property.
Size of Land . . . . . (Valued by Company at $15,000.00)	15 acres. Railroad frontage 1305 feet, depth 550 feet. All city improvements, except pavement.
Buildings . . . . . (Cost of Buildings $63,704.00)	Sixty thousand square feet of floor space. Brick-mill construction, except test sheds, boiler room, etc. Main buildings 385 ft. by 80 ft. and 250 ft. by 80 ft.
Equipment . . . . . (Cost of Equipment $22,250.00)	Fully equipped with Automatic Fire Protection, Electric Power, Heating, Lighting, Compressed Air, Sewer and all underground service, Shafting Equipment, Etc., and Office Equipment.
Machinery and Tools . . . . . (Cost of Tools, Etc., $75,350.00)	Best available for Automobile Engine service, or for any medium machine shop production.
Merchandise, Stock, Etc. . . . . (Inventory on basis of Company's Cost and Records, $123,750.00)	Finished and partly finished for Amplex Cars; raw supplies are standard; over 500 Amplex Cars are in use. Parts are available to complete about 15 cars, with other parts available for a number of standard type Four Cycle Cars.

This factory made the great "Valveless Amplex," admittedly the best all-around-car on the market for Cross Country and hard driving—a chassis that is not surpassed by any car of its class—equally available for Four Cycle Engines.

Please understand this: The difficulties of the Amplex Motor Car Company were not due to the failure of the two-cycle engine principle. It stands as a successful demonstration of a two-cycle Valveless Engine, and it only needs a practical business management to make the business a trade success for pleasure or utility cars.

Old owners are more enthusiastic over the Amplex Car as the years go by, because they withstand the most severe road grief.

This plant is exceedingly well located for the manufacture and distribution of Automobile Trucks, Gas Engines, Auto Motors, Machinery except that requiring crane service, etc.)

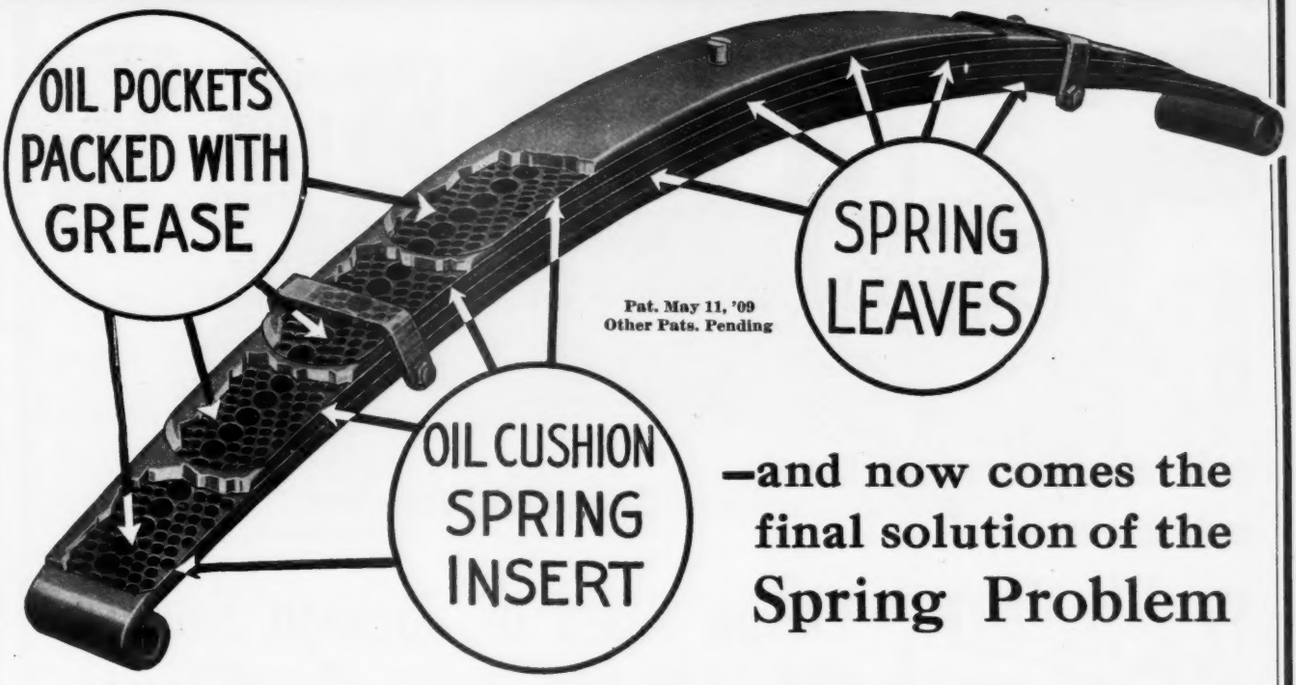
This is an exceptional opportunity to acquire a plant convenient to the great and growing manufacturing section of the Central West, situated 90 miles from Chicago, and in the heart of the St. Joseph Valley—an industrial center without an equal.

Negotiations may be started at once as it is my intention to recommend an early sale as soon as a satisfactory bid is received. The plant may be inspected at any time.

Everything is in first-class shape and ready for immediate operation.

There is a bargain here for somebody, or some firm. Address:

M. W. MIX, RECEIVER
AMPLEX MOTOR CAR COMPANY
3 BYRKIT AVENUE
MISHAWAKA, INDIANA



—and now comes the final solution of the Spring Problem

The DANN OIL CUSHION SPRING INSERT

Automobile springs today are practically the same in principle as they have always been. While the automobile has been improved with self-starters and electric lights, its springs have been neglected.

Yet the springs of a car are *many times more vital* to *long car life* and *actual riding comfort*—the two greatest motoring essentials—than *any* of the late motor car improvements.

The trouble with spring lubrication in the past has been this: At the time a car left the factory its springs were lubricated between the leaves. After a few weeks' use, the lubricant *squeezed out.*

The springs were left to rust, became stiff, almost rigid. Spring squeaks followed. The car wouldn't slide along as smoothly as before—it rode hard. The springs became *conductors* of the very force they were designed to absorb—VIBRATION!

Vibration is what eats up tires, racks the delicate mechanism of a car, boosts its up-keep, and shortens its life.

Now comes the DANN Oil Cushion Spring Insert which provides *permanent lubrication* between the spring leaves. It is the only construction of its kind which absolutely keeps springs from "going dry," squeaking or rusting. It reduces car-killing vibration to the absolute minimum, improves the riding qualities of any car, adds to its life of service, decreases the liability of spring breakage, and saves wear on tires.

The DANN Oil Cushion Spring Insert is a thin, perforated strip of metal, designed to go between the spring leaves from tip to tip.

The Insert metal is of special composition, very ductile, and possessing anti-frictional qualities.

The perforations in the Insert are filled with a heavy lubricant, made in our own factory from a special formula. A thin membrane on top and bottom of the Insert prevents the lubricant from being dislodged from these oil pockets in the course of installing the Insert. After the Insert is installed, spring friction causes this membrane to assimilate with the lubricant.

Once bolted and clipped between the spring leaves, it is *physically impossible* to squeeze the lubricant out of the pockets in the Insert.

After exhaustive tests the BORLAND-GRANNIS COMPANY of Chicago, makers of the Borland Electric, have adopted the DANN Insert as standard equipment on their entire 1914 output.

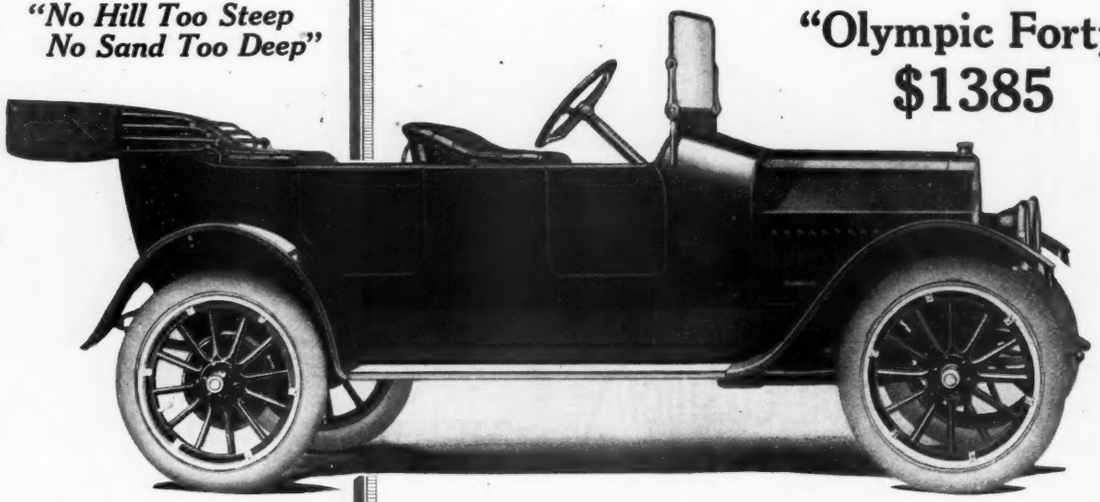
Other prominent manufacturers who realize the coming standardization of the DANN Insert in automobile construction are fast falling into line. Investigate *now.* See our exhibit at the New York show, Grand Central Palace, 4th Floor, Space D27.

"Oil Cushionize Your Springs!"

The Dann Oil Cushion Spring Insert Company
2246-50 Indiana Avenue **Chicago, Illinois**

"No Hill Too Steep
No Sand Too Deep"

"Olympic Forty"
$1385



Jackson

Three Great Models Take the Heart Out of Competition

"Olympic Forty" $1385

115-inch wheel base and wide seats; full 40 horse power; beauty of design second to none; full elliptic springs front and rear; smooth, quiet running closely approaching *silence*; electric cranking and lighting, and complete general equipment. $1385.

"Majestic" $1885

Long stroke, four cylinder motor; 45 H. P.; electric cranking and lighting. Wheel base 124 inches. Tires 36x4. Full elliptic spring suspension front and rear. Full floating rear axle with two universal joints. Extra roomy body. Wide seats, wide doors, 10-inch cushions. Completely equipped.

"Sultanic" $2150

Long stroke, six cylinder motor, 55 H. P.; electric cranking and lighting. Wheel base seven passenger, 138 inches; five passenger, 132 inches. Tires 36x4½. Full elliptic spring suspension front and rear. Full floating rear axle, ball bearing throughout. Completely equipped. Seven passenger model, $2300.

Eleven Years of Jackson Success Wins the Buyer's Confidence

A product backed by years of dependability, made by a house with a reputation for permanence, for financial stability and for manufacturing superiority,—these things win the car-buying public's confidence.

Experience has taught the purchaser to *demand* these things. The Jackson Organization and the Jackson Product *can* and *do* fit those demands. The Jackson Automobile Company has eleven years of success behind it; a reputation for quality and satisfaction; and with this year's three models the dealer fortunate enough to control the Jackson agency in his territory is assured of a successful and profitable business.

Nowhere else can you find such a combination of experience and ability, so much mechanical excellence, such completeness of equipment at such prices—all backed by an organization with such reputation, high character and permanent stability.

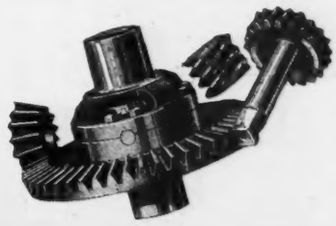
Jackson cars for 1914 are built by the same men who built the first sturdy little car of eleven years ago. They have devoted all their time, all their efforts and all their means to *perfecting* Jackson cars.

The "Olympic Forty," $1385; the "Majestic," $1885; and the "Sultanic Six," $2150, form a three model line with which you can meet every demand, from that of the buyer whose chief consideration is economy *plus* satisfaction to the buyer who wants the utmost in luxury, power and style without paying *too much* for it. In the ability to meet this wide range of choice lies one of the fundamental elements of an automobile dealer's success.

Quick sales and sure profit for the Jackson dealer—that's the story in a nutshell. For the Jackson is attracting buyers by its big value, and making satisfied customers by its real quality and durability. You can build up a permanent and paying business on such a line. Increased output for 1914 opens up an opportunity for a dealer here and there. You may be in open territory. The most profitable thing you can do is to get in touch with us right away. Write or telegraph.

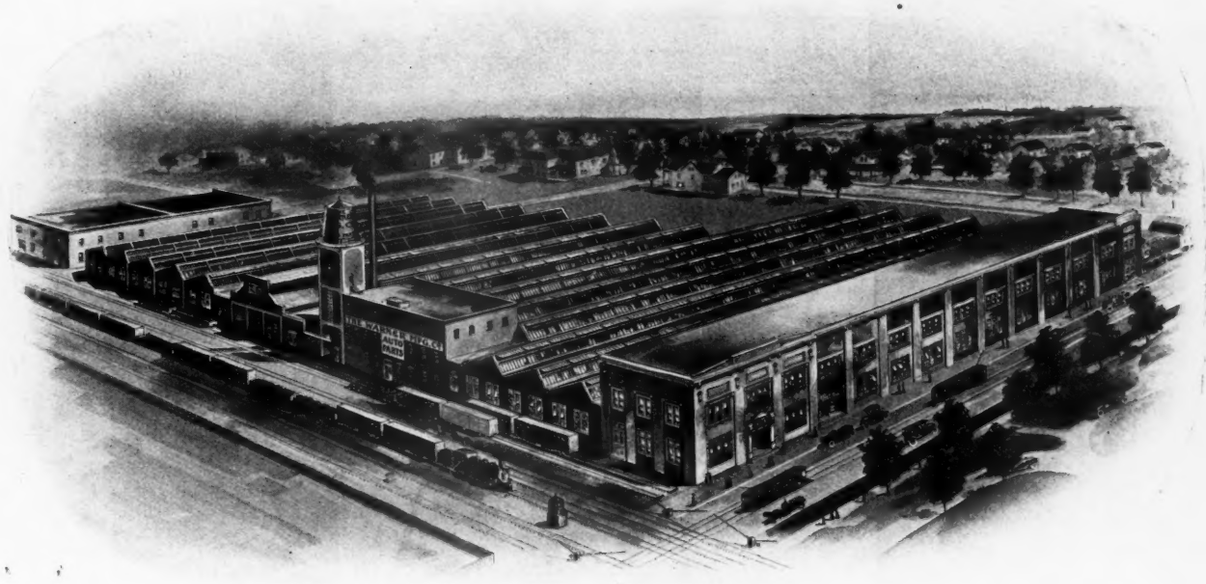
JACKSON AUTOMOBILE COMPANY
1207 East Main Street, JACKSON, MICHIGAN

WARNER TOLEDO



Ample Experience
Ample Facilities
Ample Capital

"You Will Do Better In Toledo"



The Efficient Plant

See Our Exhibit at the Chicago Automobile Show, Space No. 74, Coliseum Annex

PIONEER OF THEM ALL

Automobile Parts

Steering Gears
Clutches
Differentials
Control Levers
Transmissions
Motors

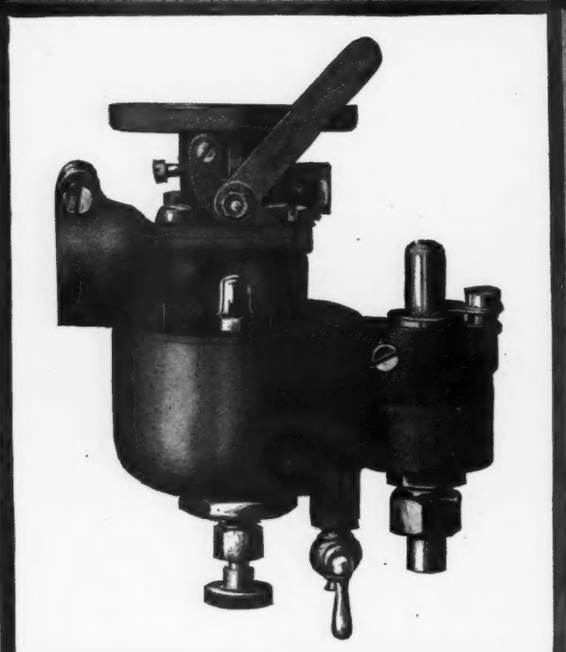
1914 Catalog Upon Request

The Warner Manufacturing Company

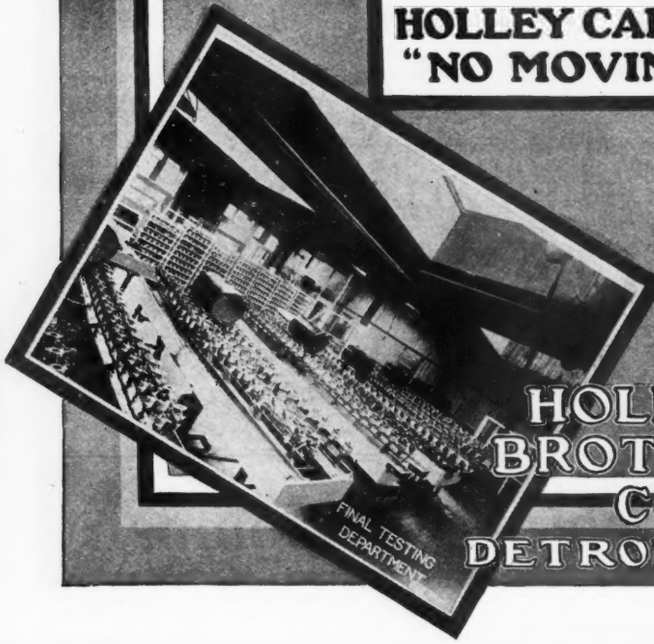
T. W. Warner, Pres. and Gen. Mgr.

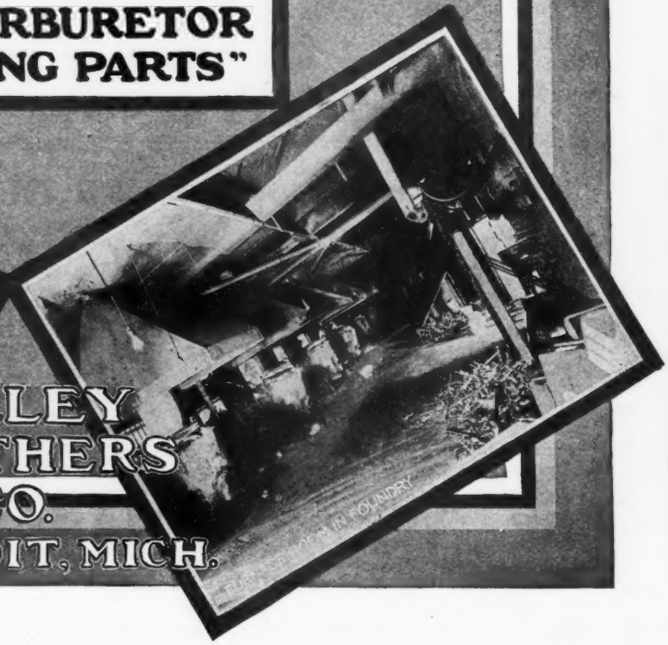
Toledo, Ohio

HOLLEY CARBURETOR



HOLLEY CARBURETOR
"NO MOVING PARTS"





HOLLEY
BROTHERS
CO.
DETROIT, MICH.

When Writing to Advertisers, Please Mention Motor Age.

ALL OVER THE WORLD

Master Vibrators
Road Smoothers
Spark Coils

TRADE K-W MARK

High & Low Tension Magnetos & Head Lighting Outfits

are giving satisfactory service to thousands and thousands of owners of large and small cars

Every Third Ford

is equipped with a

TRADE K-W MARK **Master Vibrator**

because it gives
More Power—A Hotter Spark
A Smoother Running Engine
Easier Starting
One adjustment instead of four
Uses less gasoline
Cleaner Spark Plugs
Less Carbon Deposits

It takes place of four separate vibrators in your coil, giving you one fast vibrator and a powerful condenser, which insures absolute synchronism.

It costs but $15.00 and can be put on in half an hour; change in the car not necessary.

The K-W Master Vibrator is the Standard of Excellence all over the world.

Write for descriptive folder today.

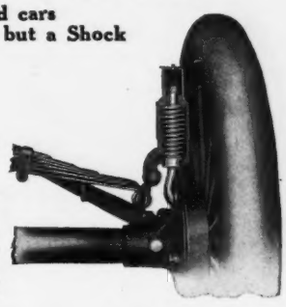
All Roads Seem Smooth

You drive with comfort and save your car and tires when you equip your car with

TRADE K-W MARK **Road Smoother**

"Just like riding on air"

Built especially for Ford cars
Not a Shock Absorber but a Shock Preventer
Easy to apply
Stops Vibration
Saves Tires

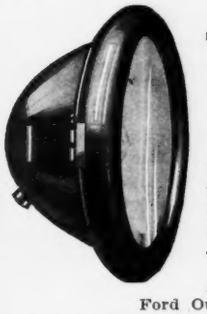


Price for Set of Four, $25.00.

The K-W Road Smoother is a combination of a spring hanger and a coil spring which acts in harmony with the regular spring hangers on a Ford Car. They take up the little jars that the larger springs cannot absorb.

They soon pay for themselves by effecting fuel and tire economies so the increased comfort costs nothing.

Write for full particulars and illustrated literature.



The TRADE K-W MARK Electric Headlight Outfit

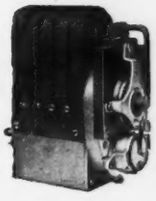
will bring your old or new car up to date. The complete outfit—Electric Generator, Head Lamps, Switch, Wire and Bulbs—only $40.00.

Write for complete information and descriptive folder. We also make the Ford Outfit for Fly Wheel Magneto, $15.00.

The TRADE K-W MARK High Tension Magneto

is the strongest magneto made, insuring absolute synchronism and requiring no coil timer or batteries.

Send description of your engine and ask for descriptive folders and price

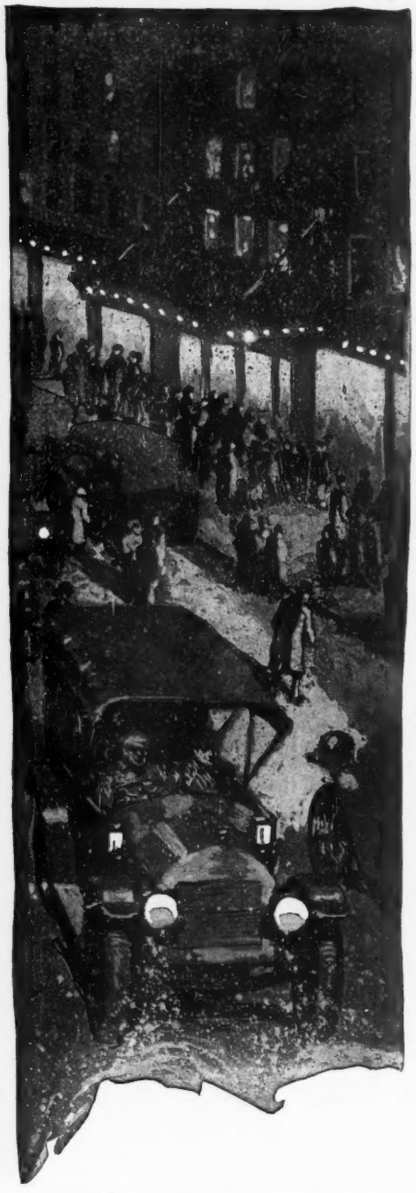


We pay transportation anywhere on K-W Master Vibrator when cash accompanies order,

Give the Street Number → 2835 CHESTER AVE.

THE TRADE K-W IGNITION Co.
CLEVELAND, OHIO. U.S.A.

and east of the Mississippi on other K-W products or to the Mississippi for points beyond.



AUTO-LITE ELECTRIC STARTING and LIGHTING SYSTEM

As Sure as the Whirl of the World.

In Winter

the real worth of electric starting and lighting systems is shown. The cold weather, snow, and slush tend to complicate conditions and make successful operation difficult.

The electrical systems manufactured by the Electric Auto-Lite Company of Toledo for use on motor cars, have been developed by patient and careful study of the unusual conditions under which such apparatus must work.

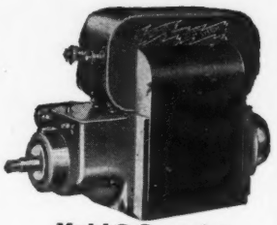
As a result, they will be found to be admirably adapted for the work for which they were designed.
Capable, compact and substantial, they are fully protected from deteriorating influences such as water, grease and dirt.

THE AUTO-LITE LIGHTING GENERATOR

is made in two types, one for lighting alone, the other combining lighting and ignition. Runs at engine speed, may be directly connected to pump or magneto shafts; no chains, sprockets or gears required.

Reaches its maximum output of about twelve amperes at car speed of about eighteen miles per hour.

Begins to produce current at six miles per hour. Operates at 6 volts, weight 37½ lbs.



Model G Generator Type S.R. 4

The combination outfit is fitted with a standard distributor and timer, and by its use the magneto is discarded and generator placed on its bracket.

Our engineering department is at your service. Complete technical literature sent on request. Send 10c in stamps for a copy of the Auto-Lite handbook on automobile electric systems.

Starting Motor

This generator produces sufficient current to keep 120 ampere hour battery, always charged for starting, lighting and ignition.

THE AUTO-LITE STARTING MOTOR

is 8 inches in length, 5½ inches in width; will crank the largest six cylinder engines at a speed of over 100 revolutions per minute on less than 100 amperes of current.

Can be attached to any automobile engine in either a horizontal or vertical position.

The Electric Auto-Lite Company

"The Pioneer Makers of the 6-volt Electric System."

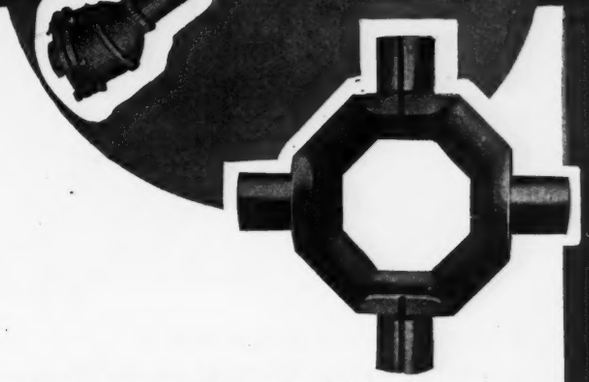
112 Michigan Street, TOLEDO, OHIO, U. S. A.

Branches: NEW YORK DETROIT KANSAS CITY SAN FRANCISCO

Look for the Auto-Lite Exhibit at the Shows

SPICER UNIVERSAL JOINTS

"SPICER" Quality is recognized as standard on American Cars



Oil Tight— Dust Proof

Parts Interchangeable

THE SPICER UNIVERSAL JOINT is accepted as the most dependable flexible connection known to motor car practice and is the universal equipment for high-grade cars.

All drop forgings used by us are made in our own plant and we, therefore, control absolutely the quality of steel in our product.

All parts accurately machined to gauge and bearing surfaces case-hardened and ground.

Highest standards of inspection maintained.

SPICER MANUFACTURING CO., Plainfield, N. J.

SALES REPRESENTATIVES

K. FRANKLIN PETERSON, 122 So. Michigan Blvd., Chicago

L. D. BOLTON, 2215 Dime Savings Bank Bldg., Detroit

THOMAS J. WETZEL, 17 West 42d St., New York

EXPORT

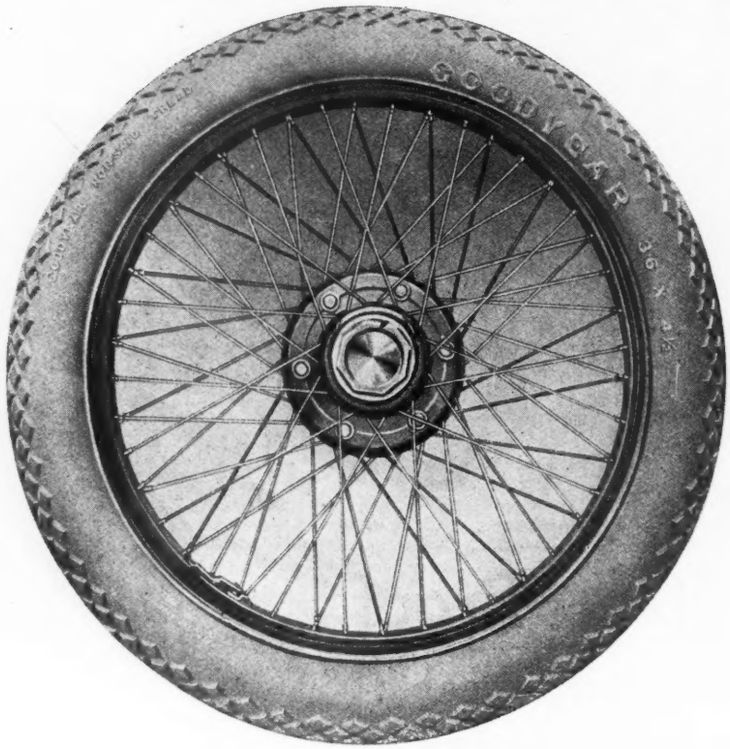
BENJAMIN WHITTAKER, 21 State St., New York

156T

THE HOUK Detachable WIRE WHEEL

Dominated at the NEW YORK SHOW

Three times as many makes of cars fitted with THE HOUK WIRE WHEEL at the New York Show-than any other. *There must be a reason.*



Ten times as many cars fitted with wire wheels at the New York Show as a year ago. *Note the trend of the times.*

THE HOUK WIRE WHEEL IS BUILT under the Rudge-Whitworth Patents—triple spoke lacing and positive automatic locking device.

THESE ARE EXCLUSIVE features no other manufacturer (except those operating under Rudge-Whitworth patents) can advocate.

We take pleasure in announcing to the Automobile Industry, that we are the first to deliver wire wheels to the trade in quantities—and on schedule time.

If you are interested in wire wheels, investigate the HOUK DETACHABLE WIRE WHEEL.

MANUFACTURED BY

HOUK MANUFACTURING COMPANY

Buffalo, New York

FOR

GEORGE W. HOUK COMPANY, 1700 Elmwood Ave., Buffalo, N. Y.

(Licensee under Rudge-Whitworth patents)

The Admitted Sensation for 1914

—*Yes, the only one*

THIS YEAR WILL MARK THE ERA of Wire Wheels.

WIRE WHEELS—*THE HOUK*—WILL SET the styles for 1914 and 1915, the same as starting and lighting systems, stream-line bodies and other improvements have from time to time.

WIRE WHEELS—*THE HOUK*—WILL DOMINATE on the latest models, as produced by our foremost builders, because the DEMANDS of the Car Owner must be recognized (as one Owner remarked the other day, "Houk Wire Wheels are the best shock absorbers I ever had on my car").

HOUK WIRE WHEELS ARE DETACHABLE and easily fitted to any car in use—think of the opportunity offered a DEALER or GARAGEMAN to handle a proposition of this kind.

CAN'T YOU—right now—picture a dozen or more prospects in your own circle of friends, who want Wire Wheels and only need your assurance that they can get *THE HOUK?*

WELL, THEN—this is your chance to get THE HOUK WIRE WHEEL AGENCY in your territory.

OUR PROPOSITION is an equitable one and if your territory is still open—you are in line for it.

MANUFACTURED BY

HOUK MANUFACTURING COMPANY

Buffalo, New York

FOR

GEORGE W. HOUK COMPANY, 1700 Elmwood Ave., Buffalo, N. Y.

(Licensee under Rudge-Whitworth patents)

NOTE: Detachable Wire Wheels for any make from FORDS TO PACKARDS.

Gasoline Bill

5 gallons per day for 30 days	150 gallons
Price per gallon	$ .17
	1050
	150
Gross cost of Gasoline per month	$25.50
50% more mileage reduces cost	**12.75**
Net saving per month	**$12.75**

YOU will pay for the Empire Gasoline Economizer, next month, whether you buy it or not—

If you use 5 gallons of gasoline per day without the Empire Economizer your gasoline will cost you $25.50.

If you do buy the Empire Economizer you will save half that cost or $12.75.

The Empire Gasoline Economizer costs $10; as long as you are going to pay for it anyway, why don't you try it for 30 days?

The Empire Gasoline Economizer is sold on a Satisfaction Guarantee; if it does not "make good" to your entire satisfaction you may ask us for your money—

You would be satisfied undoubtedly if it saved you $12.75 on your gasoline bill:

But it does more:—

The Empire Gasoline Economizer is as necessary to the efficient working of your car as is your carburetor; it regulates the gasoline and air mixture at the same time you move your throttle.

No carburetor is capable of holding back the rich mixture under certain conditions.

A rich mixture at the wrong time is most harmful to your motor.

The Empire Gasoline Economizer prevents too rich a mixture at any time.

It keeps the cylinder walls and spark plugs free from carbon;

It insures a hot spark at all times;

It keeps the engine cool;

It gives you 50% more mileage to a gallon of gasoline;

Because it burns air!

As long as you will pay for the Empire Gasoline Economizer anyway, why not have it attached to your car—

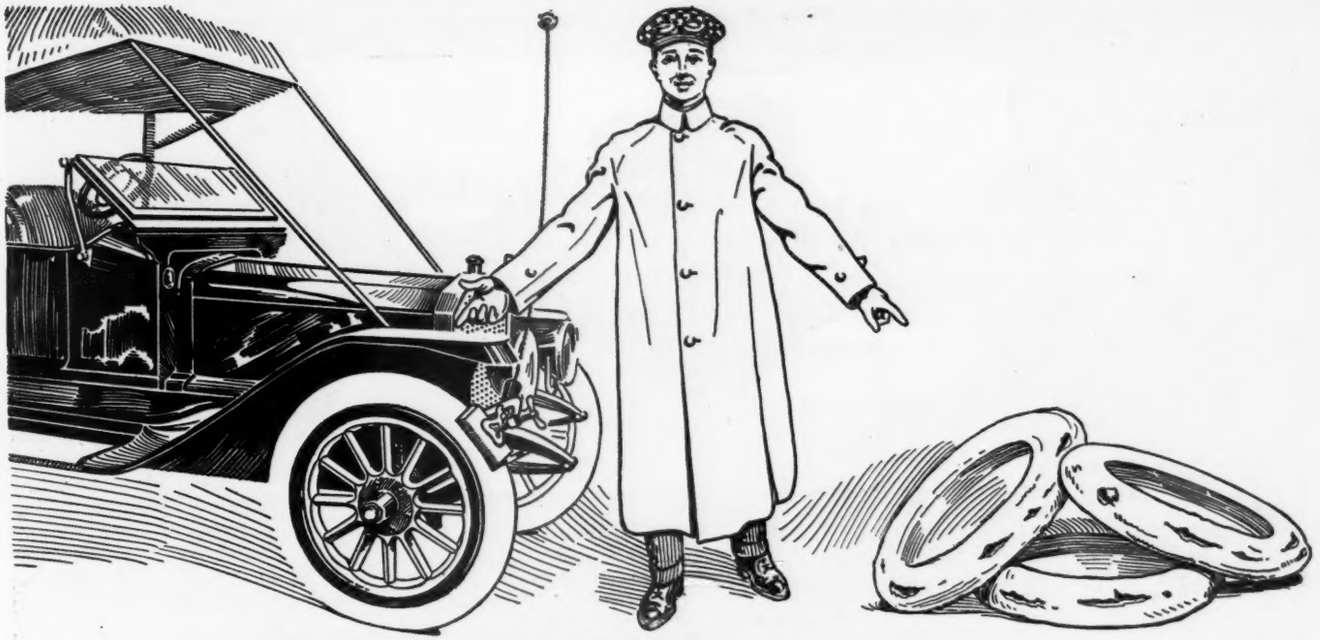
You are not one penny loser if it fails to "make good."

You earn its cost before you have to pay for it.

We can make you this proposition because we know what it has done on all makes of cars.

Write now, today, for information; if you might be interested in state rights wire us to send you our fall plans.

Brown-Taylor-Greene Company
Desk 204, 1323-25 S. Michigan Ave., Chicago



SHALER Vulcanizers

Make One Tire Outwear Three

The Shaler is the Standard Vulcanizer used by the best garages and repair shops everywhere. We make the only complete line of vulcanizers, from the small vulcanizer for motorists' use at home to complete Garage Equipment. We are the largest manufacturers of vulcanizers in the world and our complete line includes vulcanizers of every type—Electric—Gasoline—Alcohol and Steam for every requirement.

Save Your Tires

You can repair any puncture, blow-out, tear or hole in any casing or inner tube—anywhere—in a few moments with a Shaler Vulcanizer. Vulcanizes thoroughly and makes the repair the strongest part of the tire. Every Shaler has automatic heat control which makes it impossible to overcure or undercure the tire. The Shaler does not need to be watched. It works automatically. Simply clamp the Shaler Vulcanizer to your tire and it does the rest. A boy can operate it.

Treble Your Mileage

Keep your tires in good condition with a Shaler Vulcanizer and you will get extra long mileage. Seal up the little holes, stone cuts, etc., (that expose the fabric to dirt and water) increase your mileage and stop your tire trouble. A Shaler Vulcanizer pays for itself many times over in increased mileage.

Save Repair Bills

A SHALER VULCANIZER SOON PAYS FOR ITSELF BY SAVING REPAIR BILLS—but you do more than save repair bills—you save time and trouble and at the same time save two-thirds your tire cost by trebling the mileage you get from your tires. Buy the best tires and keep them in good condition and watch the saving in trouble and expense. Mend the little holes and little cuts and prevent blow-outs, and punctures. Carry a Shaler Vulcanizer as part of your regular equipment, then you can quickly "Seal the Cuts and Save the Tires."

Prevent Blow-Outs

Every time you seal a cut or tear in a casing you prevent a blow-out that is bound to occur if the cut is left open and the fabric exposed to dirt and water. If you stop the ltttle hole or stone cut you prevent the big blow-out and possibly a serious accident.

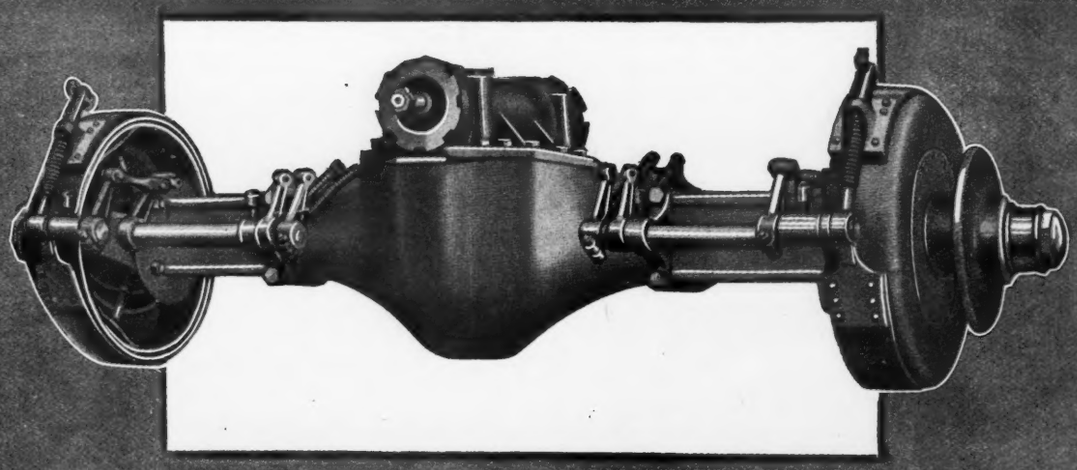
Free Book "Care and Repair of Tires"

will be sent postpaid on request. Every motorist needs it because it's full of valuable information and hints about the care of tires.

To Dealers—Garages and Repair Shops

The Shaler is the only complete line of Vulcanizers made—recognized as "Standard" everywhere. It is the only Vulcanizer with **Automatic Heat Control.** More Shaler Vulcanizers are sold than of all other makes combined—and every Shaler is Guaranteed. Many dealers make $15 to $20 a day extra profit vulcanizing tires with Shaler Vulcanizers. Accessory Dealers find them quick sellers that give perfect satisfaction. Every Garage and Repair Shop needs a Shaler Vulcanizer for its own use, and can increase its profits by selling them to motorists to use at home. The Vulcanizer is the only accessory never furnished with any car's equipment, and every motorist needs one. Get full information—with Special Dealer's Book—"Common Sense About Tire Repairs."

C. A. SHALER COMPANY, 201 Fourth Street, Waupun, Wisconsin



It will pay YOU to BUILD SILENCE into YOUR TRUCKS

You Can Do It Best—and Most Economically—With—

SHELDON WORM GEAR DRIVE

The day is now in sight when the discriminating motor truck buyer will insist upon worm drive. He realizes that the elimination of noise means increased efficiency. He knows that the worm drive is not dependent upon delicate adjustments, and that its efficiency actually increases in service. Wear in any other form of drive causes extreme noise, does *not* have this effect upon the worm and worm wheel.

All the quality of design and workmanship that has made SHELDON SPRINGS and SHELDON AXLES famous is built into SHELDON WORM DRIVES. The worm is almost indestructible and will stand years of wear; the wheel is of phosphor bronze. SHELDON KNOWLEDGE and SHELDON EXPERIENCE make these the best obtainable.

In addition to the silence of the truck, think of the *neatness*, the *simplicity*, the *efficiency*—that are distinct advantages of the worm drive.

Remember that *every noted European manufacturer of commercial vehicles is using worm drive.* These European manufacturers have proved that the long life, quiet running and high efficiency of the worm drive are sufficient reasons for its use on their trucks.

And if you desire still further evidence of the desirability of worm drive as an asset to greater efficiency and increased sales value of *your* trucks—write us.

SHELDON AXLE COMPANY, Wilkesbarre, Pa.

Chicago Office
68 E. 12th St.

San Francisco Office
444 Market St.

Detroit Office
1215 Woodward Ave.

The Qualities I want in a Top material I can get only in

Pantasote

"I want a good looking material. *Pantasote*

"I want a material that looks well after long service—as well as when new. *Pantasote*

"I want a top material that won't FADE or become shabby. *Pantasote*

"One that is water-proof and remains water-proof. *Pantasote*

"One that won't crack, peel off or chip off. *Pantasote*

"A material unaffected by sunlight or temperature changes or grease. *Pantasote*

"I want a material that can be easily washed clean with soap and water. *Pantasote*

"And lastly, I want to know that the material is made and backed by a company of long standing and reputation." *Pantasote*

These qualities and this satisfaction you DO get in *Pantasote*

Write today for "What's What in Top Materials"

This book has invaluable information for the motorist. It rips open and dissects ALL kinds of top materials—*Pantasote* included.

Write for it today and we will send it without cost.

THE PANTASOTE COMPANY

81 Bowling Green Bldg., New York City

Look for this label on your Top—furnished free to top makers with every yard of Pantasote.

TO USE THIS LABEL ON MATERIAL NOT Pantasote MADE IS A PENAL OFFENSE

Johns-Manville Service Branches in 49 Cities Assure Satisfactory Service to Jones Speedometer Owners

Service Branches

AKRON, O. 2d Nat. Bk. Bldg.
ALBANY, N. Y. 260 Central Ave.
ATLANTA, GA. 31 A S. Broad St.
BALTIMORE, MD. 207-13 E. Saratoga St.
BIRM'GH'M, ALA. 851-52 Brown-Marx Bldg.
BOSTON, MASS. 55-59 High St. 109 Mass. Ave.
BUFFALO, N. Y. 206-208 Main St.
CHARLOTTE, N.C. 1117 Commercial Bank Building
CHICAGO, ILL. 322 N. Mich. Ave. 1428 S. Mich. Ave.
CINCINNATI, O. 654-656 Main St.
CLEVELAND, O. 813-15 Superior Av., N.W.
COLUMBUS, O. 45 W. Long St.
DALLAS, TEX. 503 Sumpter Bldg.
DAYTON, O. 229 4th St., Arcade
DENVER, COLO. 534 Denver Gas & Elec. Light Bldg.
DETROIT, MICH. 72 Jefferson Ave. 872 Woodward Ave.
DULUTH, MINN. 205-206 Prov. Bldg.
GALV'STON, TEX. 2209-11 Strand St.
HOUGHT'N, MICH. 96 Sheldon St.
HOUSTON, TEX. 706 Stewart Bldg.
INDIAN'P'S, IND. 30 S. Penna. St.
KAN'S CITY, MO. 1321-23 Main St.
LOS ANG'S, CAL. 222-24 N. Los Ang.
LOUISVILLE, KY. Paul Jones Bldg.
MEMPHIS, TENN. 45 S. Third St.
MILW'KEE, WIS. 201-31 Clybourn St.
MPLS., MINN. 251-253 3d Ave., So.
NEWARK, N. J. 239 Halsey St.
NEW ORL'NS, LA. Magaz. & Gravier
NEW YORK, N. Y. Madison Av. & 41st and 2160 Broadway
OMAHA, NEB. 1003 Farnam St.
PHILA'PHIA, PA. 21-25 N. Second St. 514 N. Broad St.
PITTSBURGH, PA. 100-102 Wood St.
PORTLAND, ORE. 22 Front St.
ROCH'ST'R, N. Y. 521 Cham. of Com.
ST. LOUIS, MO. 501-505 N. 3d St.
ST. PAUL, MINN. 615 Ryan Annex
SALT LAKE CITY, UTAH. 306 Dooly Blk.
SAN FR'SCO, CAL. 2d & Howard Sts.
SEATTLE, WASH. 1020 1st Ave., So.
SYRACUSE, N. Y. 344 Gurney Bldg.
TOLEDO, O. 213 Water St.
WASH'NT'N, D. C. 304 Union Tr. Bdg.
WILKES-BARRE Coal Exch. Bldg.
YOUNGSTOWN, O. 502 Stambaugh B.

This list is being steadily increased

Circles on map indicate J-M Service Branches. Dots indicate location of direct representatives.

Right in Principle and Backed by the Right Kind of Service and Guarantee

The H. W. Johns-Manville Company stands back of the Jones Speedometer with forty-nine established Service Branches, equipped to make repairs and replacements as efficiently as the factory, and with 589 direct representatives located all over the country.

Such unrivalled service is only made possible by the advantages which the H. W. Johns-Manville Company enjoys in being able to distribute the great cost of maintaining this service over the entire line of J-M accessories. No single article could sustain the enormous expense of a service of this character.

Jones Speedometer

Centrifugal Principle

Centrifugal force, applied in the Jones Speedometer, is as unalterable as the law of gravitation. The official charts of comparative tests conducted by the Columbia University to determine the effects of changes in temperature on different speedometers, show the Jones to be consistently reliable while instruments of the magnetic type showed a gross variation of from 20% to 35% at varying car speeds.

To the efficiency of the Jones Speedometer is now added the surety of Johns-Manville Service. Should your car meet with an accident or should a change in the size of your tires make adjustment necessary, you will always find Johns-Manville Service conveniently at hand.

Note the Guarantee Tag that accompanies each Jones Speedometer. It guarantees the instrument against defects in material and workmanship indefinitely, *without time limit*. It lists the many J-M Service Branches. It means that the Jones owner must be satisfied. Specify the Jones Speedometer on the car you buy. Write nearest Branch for booklet.

H. W. JOHNS-MANVILLE CO.

Manufacturers and Marketers of Brake Lining, Spark Plugs, Electric Lamps, Speedometers, Horns, Fire Extinguishers, Dry Batteries, Vaporizers, Auto Locks, Fuses, Tapes, etc.

Madison Ave. and 41st St., New York

THE CANADIAN H. W. JOHNS-MANVILLE COMPANY LIMITED

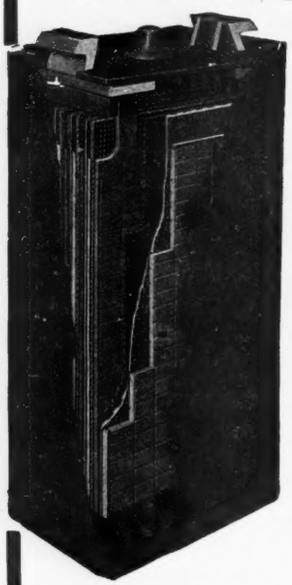
MONTREAL, QUE., 450-452 St. James St.
TORONTO, ONT., 19 Front St. East
VANCOUVER, B. C., 511 Winch Bldg.
WINNIPEG, MAN., 92 Arthur St.

JOHNS-MANVILLE SERVICE COVERS THE CONTINENT

2278

Where the Gould Storage Battery Does Hard Work

The following well known organizations are users of Gould-Storage-Battery-driven vehicles:



American Express Co.
Seeing New York Automobile Co., New York, and
International Sight Seeing Co., Washington
Arnold Constable & Co., New York
H. B. Claflin Co., New York, and
R. H. Macy & Co., New York
Jordan-Marsh, Boston
Halle Bros., Cleveland
Balbach Smelting & Refining Co., Newark, N. J.
Pittsburgh Malleable Iron Co.
The Larkin Co., Soap Mfrs., Buffalo and Philadelphia
Knowlton Warehouse Co., Buffalo
H. C. & A. T. Piercy Contracting Co., New York
Arlington Textile Mills, Lawrence, Mass.
Dover Stamping & Mfg. Co., Cambridge, Mass.
Jos. Darlington & Co., Importers, Philadelphia
Boyerton Burial Casket Co., New York
Hornthal & Co., New York

One glance at the list should tell you that the service in these places is hard and steady. On further consideration you appreciate too that such firms have experienced men in charge of transportation, men who demand and must get promptness, efficiency and economy. Their Gould Batteries must do good work at low annual cost and be dependable.

These conditions are easy for us because of the special plate construction which enables a Gould Storage Battery to deliver extremely high mileage from every charge and throughout exceptional life.

Gould battery renewals fit jars of any make.

One installation will warrant another.

Tell us your conditions and size of battery and get our prices.

Gould Storage Battery Co.

GENERAL OFFICES: 30 EAST 42nd ST., NEW YORK

Boston: 89 State Street. Philadelphia: 613 Betz Bldg. Chicago: The Rookery. Detroit: Boyer Building. Cleveland: American Trust Building. San Francisco: 904 Rialto Building.

WORKS: Depew, New York

Agents in: Washington, Kansas City, Denver, Topeka, Los Angeles, Seattle: Canadian Representative, R. E. T. Pringle: Toronto, Montreal, Winnipeg, Vancouver.

Full stock of parts, plates, and repairs carried by all offices and agents (75)

Live at the Hotel McAlpin

WHEN you come to New York you naturally are interested above all else in deciding where to live.

The Hotel McAlpin extends to its guests the luxurious, home-like accommodations and facilities possible only with the largest and safest hotel in the world — wonderfully organized and conducted on the highest plane of service — at prices notable for their moderation.

Its surroundings are distinctive in character — its service exceptional — its appointments unusually complete — its restaurants and cuisine unexcelled — and its prices are those you have always wanted to pay for the highest grade of accommodation.

Location ideally central — Broadway and 34th Street — in the midst of the big shops and amusement district — within one block of the Pennsylvania Terminal — a short walk from Grand Central station.

Management of MERRY & BOOMER

HOTEL McALPIN

Herald Square

NEW YORK

Nearer *than* Anything *to* Everything

This Line of Ford Specialties is Distinctively Different—the Kind That Sell and Stay Sold

Our Rhoades' Ignition System furnishes a true high tension magneto type spark, which is in absolute synchronism with the motor regardless of speed or any other operating conditions; however, it is far superior to the best magneto manufactured, as the spark is as powerful at one revolution as at 3,000 revolutions per minute, insuring easy starting. A device is also included for starting on the spark and our Special Ford fittings enable anyone to install without machine work.

It adds wonderfully to speed, power and smoothness, and leaves the Ford Fly Wheel Magneto to be used as an electric light generator.

Price, including all fittings, $27.00.

Allowance made for your old coil.

The New Model "T" Ford Master Vibrator at $10.00

and our **Large Senior Master Vibrator** furnished with plain, kick, or Yale lock switch at **$12.00, $14.00** and **$16.00** are recognized by all Ford owners and dealers to be SUPERIOR TO ANY EXISTING TYPE.

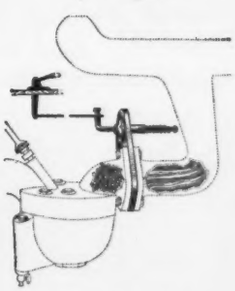
Our New "NYCO" Two System Switch

"Patent applied for" allows the four coils to be operated by their own vibrators or a touch **instantly changes to the Master Vibrator,** giving the Ford owner a **combination** and a **security** from ignition troubles **found only** on the very high priced cars.

Will work in connection with **any make of master vibrator or coils.** No change in the present wiring to install.

Price complete, $5.00.

The "NYCO" Accelerator and Power Adder



For Ford Cars

will increase the **efficiency, power, speed,** and **smooth running of any Ford** to a **wonderful extent.** It will effect a remarkable **saving in gasoline** and **add a smoothness** impossible to obtain without this device. Installed **without boring or removing inlet pipe** and is the most satisfactory instrument of this kind so far devised.

Price $5.00, complete

Liberal discounts and co-operation to the trade. Your inquiries will receive expert and prompt attention

NEW YORK COIL CO., 338 Pearl St., New York City, N. Y.
WESTERN BRANCH, 1429 Michigan Ave., Chicago, Ill.

Do Your Own Welding!

Save time and money on repair jobs! Don't send out your repair work. You can now *do it yourself*—and save a lot of time for your customers and money for yourself.

Don't buy and wait for new parts! You can *make old parts as good as new* by using the

Cox Welding Outfit

(For Welding and Carbon Removing)

Complete in every detail. Will do every possible welding job. Very simple in construction. Can be used on parts of iron, steel, brass, bronze and aluminum. Any average mechanic can become adept in its use in a short time. We furnish complete instructions with each outfit. It is *safe* and *sure*. Every job you do means—*Extra Profit for You.*

The outfit will pay for itself many times over. It means quick repair work—and *all of it done in your shop!*

The Cox Outfit is not only excellent for welding, but it can also be used to *Quickly and Completely Remove Carbon from Cylinders!*

Thus you have a dual outfit—a profit maker two ways! Its use is doubled. It saves time in two ways—and produces two profits!

Send for free catalog and full information NOW

See our exhibit at the New York Show

Cox Brass Mfg. Company

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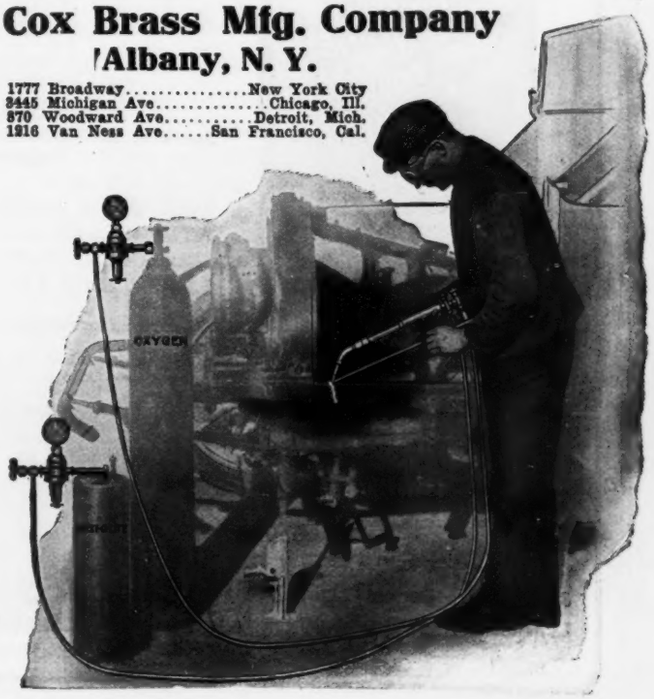
870 Woodward Ave.....Detroit, Mich.
1216 Van Ness Ave.....San Francisco, Cal.



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AMES Exhibit at New York and Chicago Shows

Clarence N. Peacock & Company

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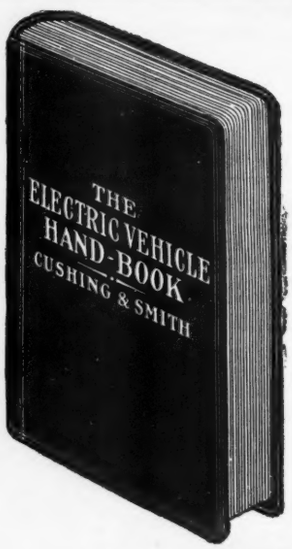
5986 Center Ave., Pittsburgh, Pa.



THE ONLY BOOK ON THE ELECTRIC VEHICLE PUBLISHED

"The Electric Vehicle Hand-Book"

JUST OUT

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THE ONLY COMPLETE AND PRACTICAL BOOK ON THE OPERATION, CARE AND MAINTENANCE OF ALL CLASSES OF ELECTRIC VEHICLES, THEIR STORAGE BATTERIES, MOTORS, CONTROLLERS, TIRES AND ACCESSORIES.

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III.—Care of Lead Storage Batteries; Assembling and Putting New Batteries into Condition; Charging; Charging Overnight; Emergency Charging; Inspection; Electrolyte; Cadmium Readings; Lead Burning.
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VII.—Measuring Instruments, Electrical and Mechanical.
VIII.—Wheels, Rims and Tires; Their Care.
IX.—The Motor, Construction and Care.
X.—The Controller, Construction and Care.
XI.—The Chassis, Its Components, Their Upkeep.
XII.—Associations and Publications Identified with the Development of the Electric Vehicle.
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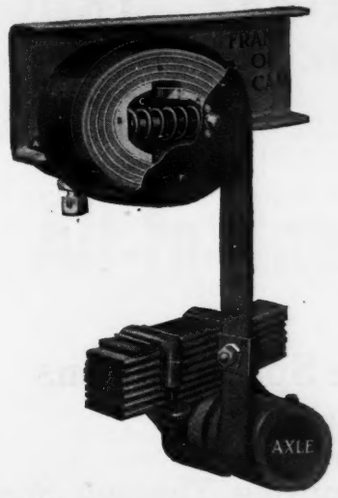
THE CLASS JOURNAL CO.
910 SOUTH MICHIGAN AVE., CHICAGO, ILL.

Sent post paid to any address on receipt of Price.

Immense Production Brings New Prices for 1914



Easy to attach as a pair of lamps. Clamp coil to frame and secure belting around axle. Nothing to work loose, rattle or wear out. No future readjustment required. Snubbers allow the springs to work naturally on the closing movement, but retard abrupt or excessive expansion; prevent the snappy rebound that jars mechanism and passengers; put a stop to excessive up and down movement of springs.

GABRIEL SNUBBERS

$15, $20, $25 Per Set of Four

Half these Prices Per Pair

We share with our customers the great saving in manufacturing cost that has followed the general adoption of Gabriel Snubbers by the auto industry—

Standard Factory Equipment on Peerless, Stearns, White, Oldsmobile and Lozier
Partial or Special Equipment on Over 20 Other Makes

Ask the Engineering Department of YOUR car what they think of Gabriel Snubbers for making cars ride easy, reducing their upkeep expense and increasing their length of service.

Full Information on Request

GABRIEL HORN MFG. CO., 1415 E. 40th St., Cleveland, Ohio

Makers of the Famous Gabriel Musical Horns and Windshield Cleaners

A Car of Greater Worth Than $1195 Would Ever Before Buy

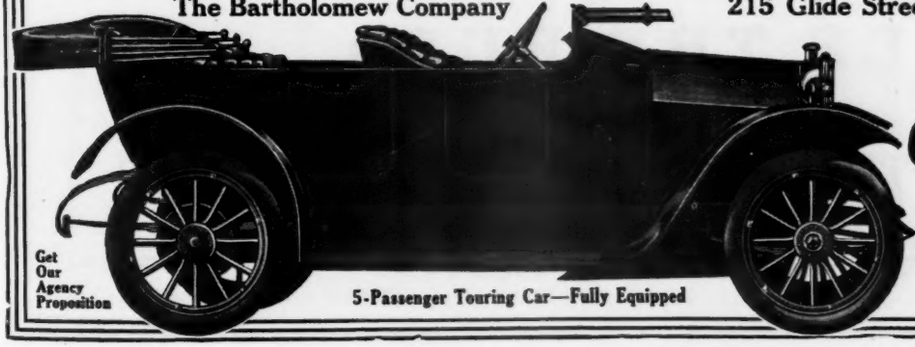
Equipment

Westinghouse Electric Starting System
Westinghouse Electric Lighting System
Motor Driven Tire Pump
Unit Power Plant
Long Stroke Motor *Left Side Drive*
Stream Line Body—Concealed Hinges
Enclosed Valves *Center Control Levers*
Gasoline Tank under Cowl Dash
Demountable Rims
Floating Rear Axle with Pressed Steel Housing
Goodyear No-Rim-Cut Oversize Tires
114 Inch Wheel Base

In all the 31 years of its existence, the company behind this Model 30 has never been "reorganized." It is a *stable* Company. Since 1882 it has stood for the highest standards of manufacture. Its automobile product is just as substantial as its business policy—which has always been to give *more* than the price asked demands.

The Model 30 is a car of maximum value at a minimum figure. Factory equipment and efficiency have enabled us to reduce production cost—and the individual buyer *profits* thereby. In appearance—equipment—construction—from *every* standpoint of car excellence this Model 30 is a *good* car at a *low price*. Dealers will do well to learn more about this $1195 automobile—also about our Model 36, selling at $1840. *Please write for catalogs.*

The Bartholomew Company **215 Glide Street, Peoria, Illinois**

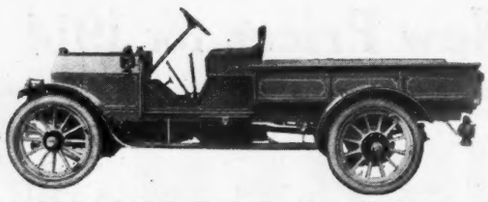


Glide

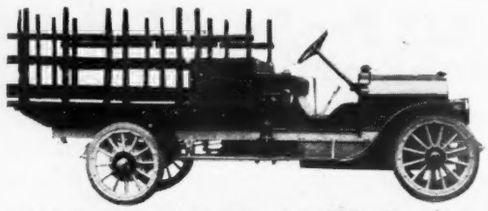
Model 30

5-Passenger Touring Car—Fully Equipped

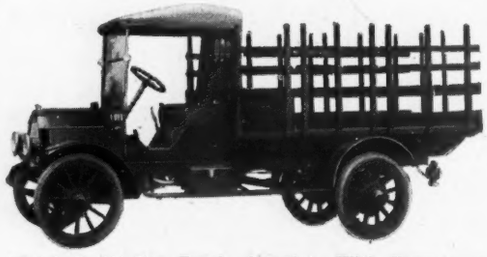
Get Our Agency Proposition



Model A-3, 1-500-lb. Truck, Complete with Express or Stake Body, $1,200.



Model B 1-Ton Truck, Complete With Express or Stake Body, $1,500.



Model C, 1½-Ton Truck, Complete With Express or Stake Body, $1,950.

$1200 $1500 $1950

"The MENOMINEE" TRUCKS

FOR ECONOMY

The 1914 line of MENOMINEE Trucks comprises a 1500-lb. truck at $1200; a 1-ton truck at $1500; and a 1½-ton truck at $1950.

More of these trucks are in use today than any other make of car of the same size and price on the market. Part for part, specification for specification, you cannot find their equal within hundreds of dollars of their price.

Note These Specifications

4-Cylinder Unit Power Plant
Sliding Gear Transmission
Shaft-Drive, Transmitting Through Special Reduction Gear
Full-floating Rear Axle

DEALERS: The big demand in 1914 is to be for trucks at our prices. Ninety per cent of the truck prospects in your territory are MENOMINEE prospects. Better find out about our dealers' proposition today.

D. F. Poyer Company, Menominee, Mich.

Something in the Very Looks

of the BUDA MOTOR

"The Part That Sells the Car"

makes both layman and engineer put it in "Class A."

As a just and able man shows his qualities in his face and bearing, so a machine, built with care and conscience, to do all it "agrees" to do—and more—shows it in a sort of sturdy beauty in every line and surface. Everyone interested in automobiles should

New York Show
Sec. C, 7-8
3d floor
Jan. 3-10

SEE THE BUDA at The Shows.

THE BUDA COMPANY

FACTORY, HARVEY, ILL., (Chicago Suburb)
Address all correspondence to our **FACTORY REPRESENTATIVES**
BRANDENBURG AND COMPANY
1108 SOUTH MICHIGAN AVENUE, CHICAGO FORD BUILDING, DETROIT 57TH AND BROADWAY, NEW YORK CITY

Chicago Show
4 and 5 Gallery
Jan. 24-31

Weather Forecaster says, "A Hard Winter" FORD OWNERS need

All-In-One Spark Plugs

WHEN the weather has frozen your engine stiff and your car simply will not start because Jack Frost won't let it—you can fool him in a jiffy by having a hot spark and a rich mixture right at the firing point. Your car will start any time and every time with the ALL-IN-ONE-SPARK PLUG. Simply pour a little oil in the primer.

And for cleaning carbonized contact points—and finding missing cylinders—why there's nothing more efficient or indispensable than ALL-IN-ONE PLUGS.

Ford cars in particular need them, all cars can use them.

Price $1.25

Sold through dealers or direct upon receipt of price

FRONTIER SPECIALTY CO., BUFFALO, N. Y.

MANZEL

The pump that takes the work out of tire inflating is the

MANZEL ENGINE DRIVEN TIRE PUMP

"The Engine Does The Work"

Think for a moment. When was the last time you used the hand crank on your car? Not since you've had the self-starter, we'll wager.

Now when did you last pump your tires by hand? Not very many days ago. Next time you'll spend perhaps **more** than a quarter of an hour at the job—and get all tired out and have blistered hands in the bargain.

And just as you are glad that the inconvenience of cranking is gone forever, you'll be equally pleased when the tire pumping bug-bear is banished.

In two or three minutes a **Manzel Engine Pump** will fully inflate a tire that takes 15 minutes with a hand pump. You save energy and strength as well as time.

The Manzel Two-Cylinder Engine Pump keeps tires properly inflated, thus increasing tire life 25%.

The Manzel is carefully designed, well built and perfect in operation. Can be easily attached to any car, and becomes a permanent feature.

Supplies only pure clean air to the tires.

We have fittings for all popular 1914 models.

Write for Booklet—Today.

Manzel Brothers Co.
306 Babcock Ave
Buffalo, N. Y.

Buick Owners—Attention!

We can furnish complete attachments for all 1914 Buick Models.

No machine work of any kind necessary to make the installation. Any one can put them on in his own garage.

EVERY garage and repair man should have a box of these assorted keys on hand. They may be purchased from the leading jobbers of automobile supplies or we can supply same promptly from the factory.

THE WHITNEY MFG. CO.
HARTFORD, CONN.

Economic **Reliable**

APELCO TRADE MARK

Quality **Service**

IT'S the high-grade quality of workmanship and materials entering into the manufacture of the Apelco electric products that make them the standard by which others are judged.

They're the finished result of years of testing and development; the perfected product of the pioneer in invention and perfection of automobile and motor boat electric starting and lighting systems. Simple in construction; economical to operate; best type in design, material, workmanship and compactness. Popular in price.

Apelco Quality Products

Electric Starting and Lighting Outfits for Automobiles.
Electric Starting and Lighting Outfits for Motor Boats.
Electric House Lighting Outfits.
Golden Glow Lamps for Motor Car and Motor Boat.

You'll be interested in knowing more about them. Send for full information about any or all of them.

The Apple Electric Co.
67 Canal Street
Dayton **Ohio**

(Space Contributed by Motor Age)

The Lincoln Highway

(Copy Contributed)

By **Elbert Hubbard**

A DUSTLESS, mudless, skidless highway from the Atlantic to the Pacific—that's why I should cease to worry!

Behind the project are over 100 firms and corporations who do big things. Over $5,000,000 are already pledged or in hand.

Subscriptions are asked from every cheerful good sport who owns an automobile and loves the smell of gasoline. And doesn't that take in pretty nearly all of us?

Any man who owns a machine and doesn't get in on this is a Piker from Pikersville.

It's a privilege to get in this glorious company and I wish that every reader would send a five spot or more today.

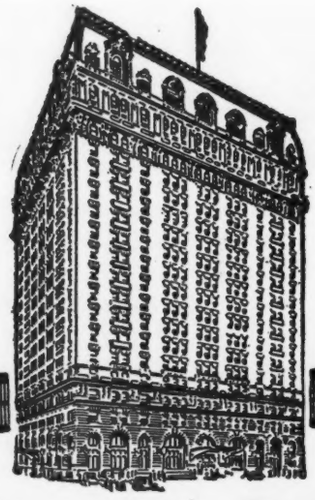
Enjoy the sweet satisfaction of knowing that you are in this glorious company who are making the world a fit place for gentlemen to live in.

Good roads are the most unselfish enterprise in the whole world of human betterments.

Send your contribution to

LINCOLN HIGHWAY ASSOCIATION
DETROIT, MICHIGAN.

Radiator Emblem, Membership Card and Certificate Sent on Receipt of Remittance.



Hotel La Salle

CHICAGO'S FINEST HOTEL

ERNEST J. STEVENS, Vice-Pres. and Mgr.

Located in the heart of the city, within easy reach of all railway terminals

RATES

ONE PERSON	Room with detached bath	$2 to $3 per day
	Room with private bath	$3 to $5 per day
TWO PERSONS	Room with detached bath	$3 to $5 per day
	Room with private bath	$5 to $8 per day

TWO CONNECTING ROOMS WITH BATH

Two persons	$5 to $ 8 per day
Four persons	$8 to $15 per day
SUITES	$10 to $35 per day

LA SALLE AT MADISON STREET, CHICAGO

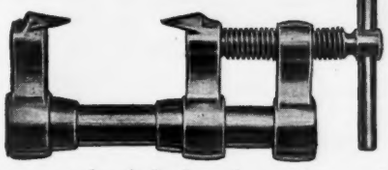
SCHRADER UNIVERSAL
TIRE PRESSURE GAUGE

"Keep the pressure right."

A. SCHRADER'S SON, INC.
783-791 ATLANTIC AVE., BROOKLYN, N. Y.

PRICE ONE DOLLAR.

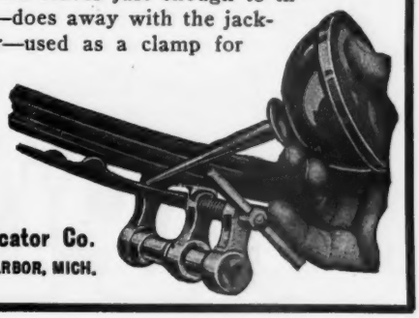
Make Your Car Ride Easier



GET 50 to 100 per cent more resiliency and longer life out of your springs by properly lubricating them. You can do it quickly and easily with the—

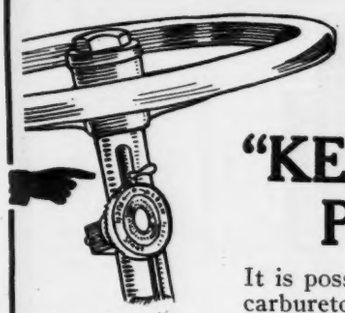
Knowlson's Spring Leaf Spreader

made of the highest grade drop forging, nickel plated, polished and well finished—adjustable to any size auto spring—separates the leaves just enough to insert the lubricant—does away with the jacking up of the car—used as a clamp for broken springs.



$1.50 all dealers or sent prepaid

Spring Leaf Lubricator Co.
1004 Forest Ave. ANN ARBOR, MICH.



BUILT ON THE "KEEP STEP" PRINCIPLE

It is possible to adjust ordinary carburetors so that they will work all right at extreme high speed, and again at extreme low speed. Whether these carburetors, however, deliver a mixture of highest power and economy **between** these two speeds is purely a matter of **guesswork.**

There is no guesswork about your mixture **at any speed,** if your car carries a—

Motsinger Carburetor increased mileage guaranteed

Shift This Lever—Forget the Weather

With the MOTSINGER you simply shift the steering post lever until your engine works perfectly. You have then determined a balanced mixture. Once this balance is found, it will be maintained by the automatic construction of the MOTSINGER throughout the entire range of running, from "idle" to the greatest horsepower your motor is capable of producing. You need never readjust this balance except to take care of noticeable changes in temperature, altitude or humidity.

You adjust the MOTSINGER steering post lever on the same principle you adjust the screw on a pair of scales—to see that they balance perfectly. Once perfectly balanced, due to their automatic construction, the scales will accurately weigh any article within their limit. Similarly, the MOTSINGER, once balanced, delivers a just-right mixture throughout its entire range.

The MOTSINGER is guaranteed to increase your mileage or your money refunded. Put one on your car or truck.

The MOTSINGER is built on a principle that differs from that of any other carburetor on the market—the "keep step" principle.

The MOTSINGER auxiliary air valve is so shaped that for each equal additional lift of the valve an equal additional amount of air is delivered. The gasoline needle is so shaped that for each equal additional lift of the needle an equal additional amount of gasoline is delivered. The quantity of gasoline "keeps step" **at all times** with the amount of air. The ratio is always directly proportional.

Unlike with ordinary carburetors, it is possible with a MOTSINGER to know that your mixture **at all speeds** is always right, always economical, always powerful.

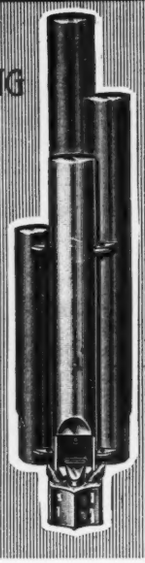
SEE US AT THE SHOWS
Space C 101, 3d Floor, New York Show
Space 32, Coliseum Gallery, Chicago Show.

Descriptive literature on request

Motsinger Device Mfg. Co.
874 PUTNAM ST. LAFAYETTE, IND.
CHICAGO DISTRIBUTOR
Rhonds & Peterson.....119-121 E. 16th St.

IT IS SELF-CLEANING

IT IS MUSICAL



IT IS CLOG-PROOF

IT WARNS

ITS FIRST COST IS FINAL

IT DOES NOT FRIGHTEN

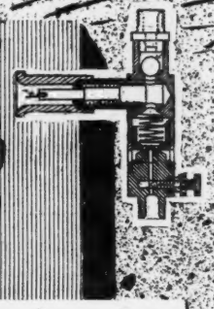
The AERMORE Exhaust Horn

15" size for 40-60 H.P. cars	$10.00
12" size for 30-40 H.P. cars	9.00
11" size for 20-30 H.P. cars	8.00
Ford Special, $5.50. 10" size for motorcycles	5.50

Complete information on request.

THE FULTON COMPANY Milwaukee, Wisconsin

The EXTRA JET makes starting as certain as sunrise



DECREASES YOUR COST OF UP-KEEP

How? By enabling the motor to start immediately—in any weather. The EXTRA JET gives added strength to the carburetor; helps supply a rich mixture—even in zero weather. With electric starter the EXTRA JET saves wear on both starter and batteries. It eliminates priming—economizes fuel.

The EXTRA JET is simple in construction; no machinery or soldering required to attach it. Nothing shows but a lever on the dash.

Costs Only $5.00

Saves many times that amount in one season. Try it for 10 days—at our expense.

WRITE FOR CIRCULAR—NOW

WELD MFG. COMPANY North Chatham, Mass.

DEALERS: No winter accessory sells easier or leaves a better profit than the EXTRA JET. Get a sample—today.

Sale of Stock, Fixtures Machinery and Tools of The Dayton Auto Truck Co., Dayton, O.

Sealed bids for the above will be received at the office of the Company, where a complete inventory and appraisement can be seen.

Bids will be received up to eleven o'clock A. M., Wednesday, the 14th day of January, 1914, and may be on separate parcels, or on the property as a whole.

Highest bids will be reported to the Referee in Bankruptcy at two o'clock P. M. on said 14th day of January, 1914, for confirmation.

Five per cent of each bid so reported shall be advanced to the Trustee, the balance to be paid after confirmation.

DAVID DUNWOODIE
Trustee in Bankruptcy

of The Dayton Auto Truck Company
First & Taylor Sts., Dayton, Ohio.

VAN DEMAN & PICKREL,
O. F. DAVISSON,
Attorneys.

"As Tough as Vanadium Steel"

Empire Spark Plug Porcelains

That is what a spark plug manufacturer wrote us. He KNEW. He had tried out EMPIRE Porcelains under stresses and strains many times greater than those met with in every-day service. He found that they stood up under the terrific heat and the incessant jarring and hammering of vibrating cylinders with efficiency close to 100%.

Send us your specifications. We'll send you sample porcelains. Try them out in any fair way you will. Prove our claims to your own satisfaction.

Manufactured by expert workmen from specially selected kaolin. Fired at a temperature of 2,600° F. Subjected to brutal efficiency test for breakage and long life.

Write for our Catalogue.

Empire China Works
142-156 Greene Street
BROOKLYN, N. Y.

EMPIRE

THROW AWAY YOUR HAND PUMP AND YOUR SPARK PLUG WRENCH!

They make trouble and expense for you. Get a

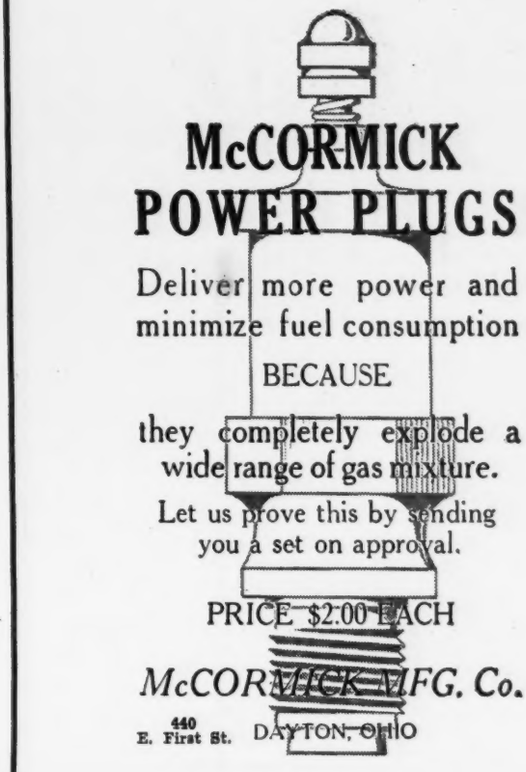
BROWN IMPULSE TIRE PUMP and B'Co. Q. D. SPARK PLUGS

Enjoy your car, save your strength and tires, stop breaking spark plugs. A B'Co. Q. D. Plug FREE with every Brown Impulse Tire Pump.

Pump complete, including hose, recording gauge and B'Co Spark Plug..... $15.00
Extra Spark Plugs..... 1.50
Previous Brown Pumps made over to fit this new connection, including plug..... 2.00

Ask any dealer or motorist or send to us for full details

THE BROWN CO., 120 Bellevue, Syracuse, N. Y.



McCORMICK POWER PLUGS

Deliver more power and minimize fuel consumption

BECAUSE

they completely explode a wide range of gas mixture.

Let us prove this by sending you a set on approval.

PRICE $2.00 EACH

McCORMICK MFG. Co.

440 E. First St. DAYTON, OHIO

Ford
THE UNIVERSAL CAR

Model T Runabout - - - - $500
Model T Touring Car - - - 550
Model T Town Car - - - - 750

With Full Equipment, f. o. b. Detroit

Ford Motor Company
Detroit, Michigan

USE A MAYO QUICK DETACHABLE SPARK PLUG WITH YOUR

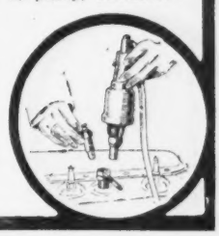
MAYO SPARK PLUG PUMP

It will enable you to attach your MAYO Pump **instantly.** "The spark plug core slips out—The MAYO Pump slips in!" Instructions for attaching with each plug. Price of pump, complete with gauge, $10.00. Quick Detachable Plug, $1.50 extra. Try a MAYO Pump free on your car for 30 days.

$10

SEE US AT THE CHICAGO SHOW

MAYO MFG. CO.
55 East 18th St.
CHICAGO



Starts — Lights — Ignites

REMY

Six Volt System-Does-It-All

AFTER inspecting the new cars at the coming Automobile Shows, you will insist on Remy equipment, not simply because it will crank engines, light the car or fire the engine, but BECAUSE:

This apparatus is designed by O. F. Conklin, the recognized authority on electrical apparatus for motor cars.

This apparatus is built under the factory management of *Men Who Know.*

The responsibility of the complete electrical apparatus is assumed by one reliable, experienced company.

A country-wide system of quick and efficient service is available for Remy users.

We are the only concern building the complete apparatus, either as a whole or in any combination—starting motor—lighting equipment — magneto, or magneto type battery ignition (generator and storage battery). (The starting and lighting equipment is sold only to motor car makers.)

Write for our magneto (any make) exchange offer.

Remy Electric Company

General Offices and Works, Anderson, Indiana

BRANCHES:

New York Boston Detroit Chicago Kansas City San Francisco Minneapolis

(Service Stations Throughout the Country)

A Reliable Electrical Measuring Instrument Indicates Quality

Weston Model 267 Dashboard Ammeter

WESTON AMMETERS

for control of **Electric Lighting and Self-Starting Systems** are the most reliable, durable and highest grade instruments made for this purpose.

Please send for our 30-page bulletin No. 8 describing them

Weston Electrical Instrument Co.

NEWARK, N. J.

New York Philadelphia Chicago Boston San Francisco St. Louis Denver Cleveland Detroit Birmingham Toronto London Montreal Paris Berlin

Operating Efficiency

for commercial or pleasure vehicle—gasoline or electric—can only be secured by knowing *exact* mileage. Upkeep cost of tires, gasoline or "juice" and lubrication can only be figured out with *exact* mileage and a VEEDER HUB ODOMETER is the only *exact mileage recorder.*

Neat, durable and compact, it can be easily attached. Price, complete **$20.00**

At your dealer's, direct from our factory, or at the following agencies:

T. H. Cranston & Co., 56 E. Randolph St., Chicago, Ill.

Bernard I. Bill, 543 Golden Gate Ave., San Francisco, Cal.

The Veeder Manufacturing Company

HARTFORD, CONN.

Makers of Cyclometers, Odometers, Tachometers, Tachodometers, Counters and Small Die Castings.

"Son, Your Lubrication Bill Is a Fright"!

"You must be lubricating everything but the places you ought to. Remember there is only one gear compound that is a money saver—that's the Badger."

Use

BADGER Gear Compound

It's "Always On the Teeth"

Never runs thin. Stays where you put it. Doesn't pack the sides of the gear case. Gives long mileage for little money. Effective noise-killer for rear axles and transmissions. We also make F. V. Motor Oil and Badger Lubricants. See your dealer or write us.

DEALERS
Write for Territory

WADHAMS OIL COMPANY
Milwaukee, Wis.

CONNECTICUT

Master Vibrator For Ford Cars

Compact, neat and efficient. Fits flush and does not detract from trim appearance of dash. Sold under a service guarantee.

"Gives Magneto Service"

Requires adjustment only two or three times a year. Uses minimum current—gives a smoother-running engine—more power—less trouble in starting. **Flush type $9.00—delivered upon receipt of price.**

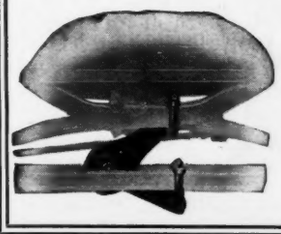
Write for Bulletin No. 36.

Connecticut Tel. and Electric Company, Inc., Meriden, Conn.

CONNECTICUT

Shock Absorbers

Reduce tire bills, prevent spring breakage and eliminate the jolts and jars which take half the pleasure from motoring. Adjust themselves automatically to road conditions and varying weight of loads.



Special For Ford Cars

Identically the same as used as regular factory equipment on Pierce-Arrow, Haynes, Knox, Cunningham, Kissel Cars and many others—except that they are lighter. Guaranteed to give service. Equip your Ford with them and double the pleasure of motoring. **Price $22.50 per set.**

Write for Bulletin No. 44.

Connecticut Shock Absorber Co., Inc. Meriden, Conn.

"The ACME of PRECISION-is The WARNER TRANSMISSION"

"Warner Gears—Standard for Years"

We shall exhibit at the coming automobile shows a complete line of our product.

New York — Grand Central Palace—C31.

Chicago—Coliseum Gallery—43

WARNER GEAR CO MUNCIE - IND -

Do You Want An Additional Talking Point For Your Products?

Our "made to order" steel will furnish this, as it will be treated to meet your specific requirements.

Almost every magazine and trade journal you pick up contains dozens of advertisements talking quality of steel until now this subject is uppermost in the minds of your customers.

Our Alloy "Chrome Vanadium," Chrome Nickel, Nickel and Special O. H. Steels are handled to meet the specific requirements of your products and this fact will have its effect on your customers when placed before them.

Our cross-rolled steel solves the problem of elimination of seams and imperfections.

Write us for prices.

The United Steel Co.

CANTON, OHIO

New York Chicago Detroit

Grinnell Gloves

Sold with a Bond

have all that beauty, all that quality, all that fine workmanship can bring to a glove, and three glove innovations besides — Rist-Fit Grip-Tite and Ventilated Back.

Rist-Fit gives Grinnell Gloves a snug fit at the wrist and prevents cuff from sagging down over the hand.

Grip-Tite, the corrugated double palm, gives the non-slip grip and sure control of the steering wheel—and double wear. Ventilated Back lets in cool air, yet keeps out dust. Grinnell Gloves are made of finest selected Reindeere and Coltskin—soft as velvet wear like iron. Washable in soap and water or gasoline—come out like new.

Morrison-Ricker Manufacturing Co.

(Established 1856)

64 Broad St., Grinnell, Iowa

Style V-4020

If your dealer doesn't carry them, send us his name and your size. We will send your selection on approval. Write for our illustrated glove booklet and samples of leather.

The Atwater Kent Ignition System

For every kind and make of motor. A system ideal in efficiency, simplicity, and reliability.

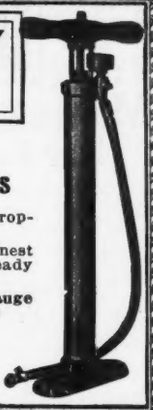
Write today for booklet A.

ATWATER KENT MFG. WORKS

74-N

4934 Stenton Ave., Philadelphia.

STAPLEY TIRE PUMP



Made by Bridgeport Brass Co.

Increases the Life of Tires

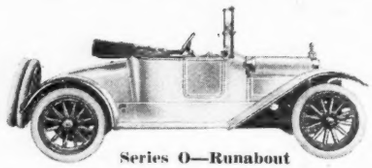
The STAPLEY makes it easy to keep tires properly inflated.

It is an efficient Compound pump of the finest materials and workmanship; it is always ready and always works.

Price without Gauge $4.00 — With Gauge $6.00

THE BRIDGEPORT BRASS COMPANY
P. O. Station A Bridgeport, Conn.

MERCER



Series O—Runabout

A runabout for the man who demands more in power, speed and comfortable riding qualities than the smaller type of two-passenger car can give.

Send for Catalogue

MERCER AUTOMOBILE CO. 800 Whitehead Road TRENTON, N. J.

HAYWOOD STEAM VULCANIZERS

THE PROFIT MAKING PLANTS

The vulcanizing system that DOES NOT use air bags. SOLID PADS and HEAVY CLAMPS are the means through which pressure is generated.

Plants from $25 to $500

Write for Catalog B.

HAYWOOD TIRE & EQUIPMENT COMPANY
524 N. Capitol, Indianapolis, Indiana

SCHAFER BALL BEARINGS

MADE IN GERMANY SOLD IN AMERICA

When you buy SCHAFER BALL BEARINGS you are not experimenting because SCHAFER BALL BEARINGS have for years been recognized as the standard of bearing quality. They are made in Germany of the best steel and are now in universal use throughout the world

BARTHEL & DALY
42 BROADWAY NEW YORK

Dorris

Built to Last

THE SILENT CAR

BUILT TO LAST

Attention, Agents!!

We are offering a big, liberal proposition and unusual sales help to Agents on the

1914 Dorris Truck & Pleasure Car

We sell "through" the dealer and not "to" him. Write today.

DORRIS MOTOR CAR COMPANY St. Louis, Mo.

Standardized Transmissions

COVERT

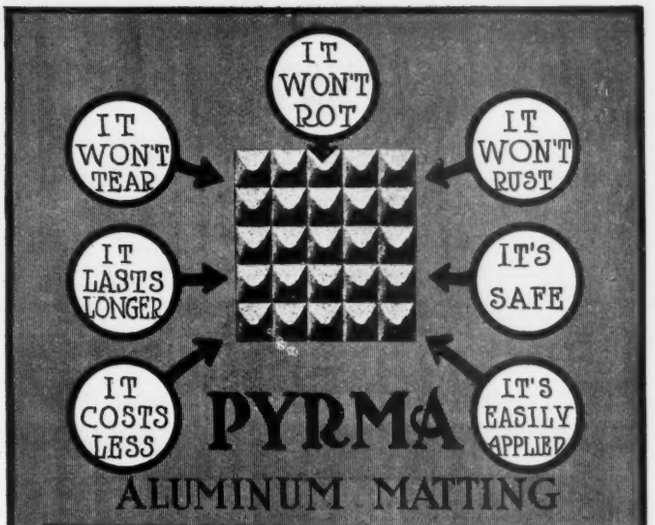
Covert Motor Vehicle Co.

Sales Office Detroit
Factory Lockport N.Y.

Corcoran Lamps

GAS, OIL, AND ELECTRIC

CORCORAN LAMP CO.
CINCINNATI, O.



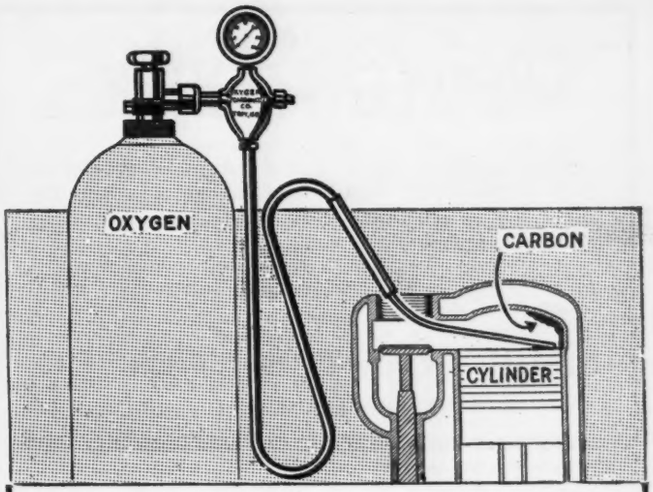
ALUMINUM MATTING

This is the cheapest, yet most durable matting on the market for automobile running boards, floor boards, motor boat floors, etc. Grease or oil will not stain, tarnish or rot it. Washing the car restores it to its original brightness. Anyone can apply it.

For sale at all auto supply houses, or send us specifications direct and we will quote prices

METALLIC AUTOMOBILE MATTING COMPANY
ROCHESTER, N. Y.

"Look for the little pyramids"



Perfect Carbon Remover $10

Will remove *all* carbon from cylinders. Easily and in few minutes. Equal of any high-priced outfit. All parts guaranteed. Keeps up efficiency of cars and trucks. *Big money maker* for garages.

Price $10

(Without Oxygen Tank)

Usual price $15. As we sell for cash only and no accounts carried, customers are given $5.00 off on every outfit. Express companies allow inspection; you take no chances. Sent prepaid cash with order or C. O. D.

OXYGEN DECARBONIZER CO. 301 River St. TROY, N. Y.

SEND FOR INFORMATION

REPUBLIC 1500 - 2000 POUNDS CAPACITY $1425

Where Can You Get as Much for so Little?

You can't dodge this conclusive fact—that in the REPUBLIC you get more value, dollar for dollar, than in any other truck on the market—and you get more in service, no matter what price you pay. In what other truck—at anywhere near the REPUBLIC price—will you find all of the following high-standard features? **Continental Motor, Covert Transmission, Schebler Carburetor, Culver-Taylor Chains, Left Hand Drive, Gemmer Steering Gear, Lewis Springs, Eisemann Magnetos, Bower Roller Bearings, Center Control.**

You know all these parts. You've read about them. You know that these are produced by **specialists.** Again, we ask you, where can you find a dependable, economical truck, with all these high-grade parts, and, in addition, a stake, or express, body for $1425?

Write for our literature today

Dealers—Think for a moment of all the splendid, convincing talking points that there are in the above specifications. The entire truck is every bit as good as its individual parts. Prove it for yourself. Get in touch with us—NOW.

"Republic Means Service"

ALMA MOTOR TRUCK COMPANY
General Sales Offices, 870 Woodward Ave., Detroit, Mich.

A Shot in the Dark

Seldom Hits Anyone But the Wrong Fellow

The same axiom applies to advertising. An advertisement in "just any paper" may catch the attention of desired parties—but it is another case of shooting in the dark and hoping to hit the mark. If you really want the attention of motor car owners, dealers or manufacturers—if you want to shoot in broad daylight, with short range and a hair trigger, use

MOTOR AGE CLASSIFIED COLUMNS

The Trading Center of the Motor Car Industry

MOTOPHONE

The Hand Operated Horn

$12

NO Adjustments Battery Troubles NO Electrical Wiring Battery Expense

Motophone—was devised to meet the rapidly changing conditions which prevail in the Automobile Industry—to be an absolutely efficient—thoroughly dependable warning signal—WITHOUT being a constant source of expense to the owner.

AUTOMOBILE SUPPLY MFG. CO.
220 Taaffe Place Brooklyn, N. Y.

SIMPLEX AUTO TOP LIFTER

Raises or lowers top in one minute—"Record operation, 30 seconds." Lifter handles one side, you the other. Top can't slip—Bow can't break. Simple—Strong—Necessary.

Dealers—They will sell as fast as you can demonstrate. Write.

SIMPLEX SPECIALTIES CO.

69 BUHL BLOCK, DETROIT, MICH.

Springs of Cross-Rolled Steel Cut Up-Keep

In this new process, the steel is worked both longitudinally and transversely. So we get superior strength and toughness. We use this process exclusively in our Chrome-Vanadium Brand of Springs.

Find out more about them. It will make a tremendous difference in the riding qualities of your car.

Best Grade—Chrome-Vanadium
Next Best—Special Analysis

TRADE CLEVELAND CANTON MARK

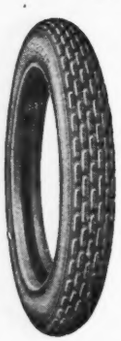
In five years not one Cleveland - Canton Chrome - Vanadium spring returned because of breakage or settling.

Let us send you full particulars

The Cleveland-Canton Spring Co., Canton, Ohio, U.S.A.

REPUBLIC STAGGARD TREAD TIRES

Republic Staggard Tread, Pat. Sept. 15-22, 1908



Among your friends are men—exceptionally keen, shrewd, far-sighted fellows—whose business judgment you respect.

These men are pretty sure to have the Republic Tire on their cars. Ask them what they think of it.

If you do this, your next tires will be Republics.

THE REPUBLIC RUBBER COMPANY
Youngstown, Ohio
Branches and Agencies in the Principal Cities

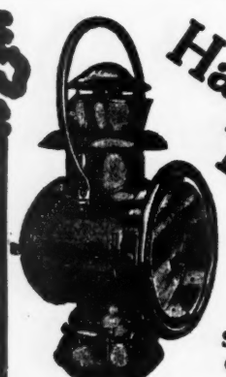
Remember To Specify Detroit Springs On your next car— For Safety Comfort Economy

RESILIENT Detroit Springs

Look for This Trade Mark

SILENT TRADE MARK SELF-LUBRICATING

The Oil Pot Inside Ham's Steel Motor Truck Lamps

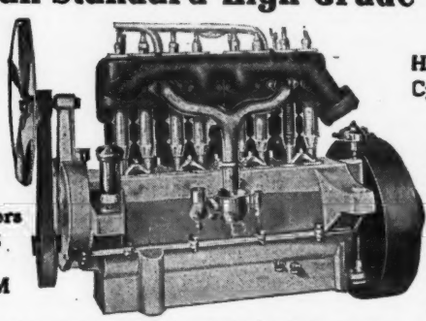


Send for Catalogue—Price List

C. T. HAM MFG. CO., Rochester, N. Y.

Brennan Standard High Grade Motors

Large Bearings Long Stroke 4 and 6 Cylinder

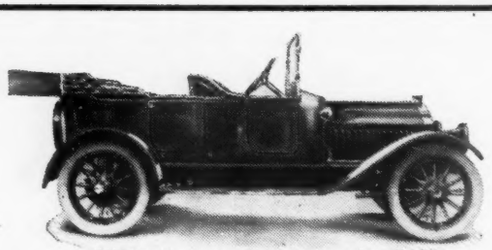


High Grade 4 Cycle Motors for Elmore Cars, Warren, Corbin, White Steam Cars and standard makes of cars and trucks, also transmission gears.

Our leaders
MODEL B 4½x5
MODEL M 4x5

4 Cyl., 5x5, 40 H. P., 4 Cyl., 4½x5, 35 H. P.

BRENNAN MOTOR MFG. CO., Syracuse, N. Y.



Marathon Automobiles

America's most comprehensive line. Every car completely equipped. 3 sizes chassis—10 body styles. Price range from $925 to $1495

Write for Catalogue M-A

HERFF-BROOKS CORPORATION, Indianapolis, Ind.

THE BENTON

THE CASE HARDENED PLUG

for SERVICE and RELIABILITY

L. F. BENTON CO.
VERGENNES VT.

KISSELKAR TRUCKS

Complete Line of Commercial Vehicles

All type bodies—special bodies designed. Unexcelled for service, efficiency and economy. KisselKar Trucks have great reserve power. Low fuel cost; sizes to give more economical service under all conditions.

1500 lbs. 1, 1½, 2½, 3½ and 6 Tons

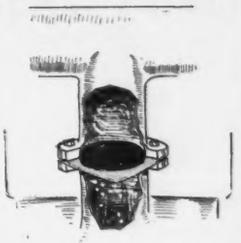
KisselKar Service Buildings at principal points throughout the U. S. are equipped to give an unusual service to owners of KisselKar Trucks. Let us analyze your haulage problem and show you how to make a big saving.

Write for Catalog—Over 200 Styles

Kissel Motor Car Co., 121 Kissel Ave., Hartford, Wis.

Gas Saving and Back Fire Preventer

More power and less wear on the motor by vaporizing every atom of gasoline, thus attaining better lubrication.



Prevents Back Firing and Makes Starting Easy

ECONOMIZES FUEL by going 50% further on a given amount of gas.

THE GAS SAVING AND BACK-FIRE PREVENTER is placed between the intake manifold and the carburetor. It's a device that is 100% perfect and saves its cost many times over in a season.

Price $3.00

Sent prepaid upon receipt of price.

GAS SAVING AND BACK FIRE PREVENTER COMPANY
125 E. 23rd Street, New York City

METZ "Twenty-Two" Roadster

THE GEARLESS CAR

"No clutch to slip—no gears to strip."

$475

1914 Improvements

Completely Equipped

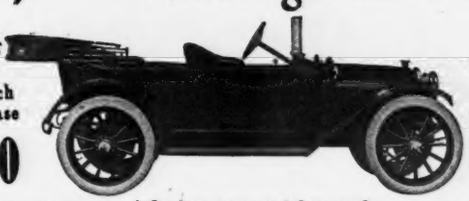
Center control, left-hand drive, 4-cylinder 22½ H. P. water cooled motor, Bosch magneto, standard artillery wheels, best quality clincher tires, extension top, wind shield, five lamps, gas generator, tools, etc. Makes 5 to 50 miles per hour on the high speed, 28 to 32 miles on 1 gallon of gasoline, and is a wonderful hill climber. A strong, reliable, stylish, fully guaranteed car. You can secure EXCLUSIVE SALE in your territory. Write at once for Book "K" and particulars.

METZ COMPANY **WALTHAM, MASS., U. S. A.**

The Vulcan 27

"The World's Greatest Light Car"

Touring Car 115-inch wheelbase **$850**



Speedster 105-inch wheelbase **$750**

NEW YORK SHOW Space B Second Floor

Ask for new catalog and fairest Dealer's Agreement ever offered

CHICAGO SHOW Space 2 Coliseum Basement

VULCAN MFG. CO., Painesville, Ohio **Lock Box MA477**

Newtype Electric Searchlight

Can be instantly installed on any car within easy reach of driver. Gives light in any direction. A special Ford type, burns at lower cost and gives more light than any Ford light.

List Price $7.00

Complete with bracket, switch and wire. Write for details.

THE WOOD MFG. CO., Fairfield, Conn.

COMPLETE THRUST BEARING

RADIAL RETAINERS

The Star Ball Retainer Co.
Lancaster, Pa., U. S. A.

Manufacturers of Radial Ball Retainers, Thrust Ball Retainers, Complete Thrust Bearings

Six Cylinder, 65 H. P. Equipped with Vulcan Electric Gear Shift

Four Cylinder, 40 H. P. Equipped with Vulcan Electric Gear Shift

HAYNES

America's First Car

Our advertising campaign will send a buyer into your showroom more than half convinced that he should own a Haynes; the sale, however, results only from a successful demonstration; it is our firm belief that as a Haynes dealer you possess more than a sufficient number of convincing arguments to make every demonstration result in a quick and profitable sale.

May we tell you why we believe this?

THE HAYNES AUTOMOBILE CO., 2 Main St., Kokomo, Ind.

Herreshoff Electric Self-Cranking Electrically Lighted

Four Forward Speeds

The Herreshoff six was the first light six built and is today conceded the best example of skillful design in combining strength with reduced weight.

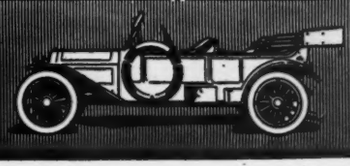
"Six-Forty" Touring Car and Roadster $1850—7 Passenger $1900

Model 4—30 Touring Car - $1350
Model 4—30 Coupe - - $1650
Model 4—30 Roadster - $1250

Live-Wire Dealers Write for Unallotted Territory.

HERRESHOFF MOTOR CO., Detroit, Mich., U.S.A.

The Thoroughbred Car



Buy Better Springs

Guaranteed against breakage and sagging at less price than of car factories. Freight allowed on four or more. In stock, painted for Ford, Buick, Cadillac, Chalmers, Hudson, Maxwell, Regal, Reo, and others.

Send for complete list and price

NEW ERA SPRING & SPECIALTY COMPANY
247 Jefferson Ave., Detroit.

How Largest Profits Are Made

Henderson De Luxe, $1785

We have some interesting facts in connection with increasing your car sales and *profits*.

Selling some cars, you may sell large numbers—and still your yearly business shows a *loss*.

Through merchandizing strategy we have remedied these flaws. May we tell you about these things and about our kerosene-burning car, equipped with wire wheels, cowl dash, cowl gasoline tank. Left drive, center seat control—the most salable car offered today.

Wire or write for the facts

Henderson Motor Car Co.
Indianapolis, Indiana

HENDERSON

The Supreme Pullman

Model 6-46

A Modern Classic

Price $2250

With Vulcan Electric Gear Shift, $150 Extra

For the first time the rules of art have been applied successfully to automobile coach and chassis building. In its Model 6-46 this company firmly believes that the acme of human endeavor as applied to automobile construction has been attained.

Fours and Sixes—$1775 to $2850

WRITE OR WIRE

PULLMAN MOTOR CAR CO. YORK, PA.

HESS AXLES

¶ HESS Axles have been on the market but 2 years. Fourteen car manufacturers in that short time exclusively adopted them as regular equipment.

¶ Renewals of HESS contracts for 1913 from past users and an increasing HESS demand among new manufacturers, is ample proof of the stability of HESS Quality.

¶ May we be of service to you? Write us.

THE HESS SPRING & AXLE COMPANY
Carthage, Ohio, U. S. A.

The Searchlight Gas Co.

1016 Karpen Building

CHICAGO, ILLINOIS

Stronger than ever, legally, financially and in the esteem of the trade. Watch us grow.

BRANCHES AND REFILLING STATIONS:

Warren, Ohio	San Francisco, Calif.	Los Angeles, Calif.
Chicago, Ill.	Buffalo, N. Y.	New York City
Detroit, Mich.	Atlanta, Ga.	Syracuse, N. Y.
Camden, N. J.	Dallas, Tex.	Minneapolis, Minn.
Philadelphia, Pa.	San Antonio, Tex.	Toronto, Canada
Kansas City, Mo.	Boston, Mass.	Indianapolis, Ind.

The Pilot "THE CAR AHEAD"

Three Great Models—Pilot 50—4 cylinder, 4½x6—59 H. P. —120 inch wheelbase, roadster and touring car—$2250. Pilot 50—roadster—4, 6 and 7 passenger bodies, 126 inch wheelbase—$2500. Pilot 60—6 cylinder, 4x6, brake test 67 H.P., 132 inch wheelbase, roadster, 4, 6 and 7 passenger touring cars—$2785.

THE CAR WITHOUT A MECHANICAL DEFECT

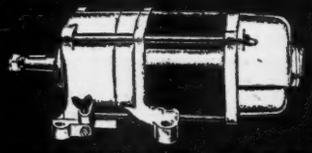
Teetor "T" Head Motors, full floating rear axles, Brown-Lipe differential, Warner transmission. Eisemann Magneto. Carter Carburetor, handsome jewel bodies with ventilating windshield. Completely equipped with every convenience and comfort. Dynamo electric lighting and electric starter (Gray & Davis system), power tire pump. We have the greatest agency proposition in the United States. Write for our beautiful art book showing cars in detail.

PILOT CAR SALES COMPANY **Richmond, Indiana**

Jesco ELECTRIC STARTING & LIGHTING

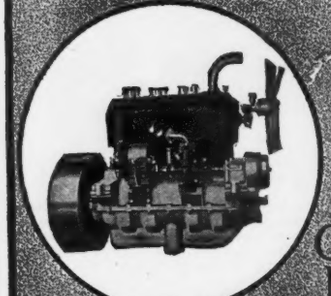
TRADE MARK

ASSURES 100% EFFICIENCY



JONES ELECTRIC STARTER CO.
ADAMS & LOOMIS STS. CHICAGO, ILL.

Continental Motors



A WORLD STANDARD FOR QUALITY AND SERVICE

4 AND 6 CYLINDER TYPES

Continental Motor Mfg. Co. DETROIT MICH

FACTORY REPRESENTATIVE F. E. PETERSON 122 S. MICHIGAN AVE. CHICAGO

Cartercar

Gearless

A big, strong, powerful car, having all those refinements and up-to-date features that make the Cartercar a continual source of pride and satisfaction to the owner.

The Cartercar Gearless Transmission insures the utmost ease in handling with no jerking or jarring clutch and clashing or stripping of gears.

Built in various body types
$1250 $1700 $2000

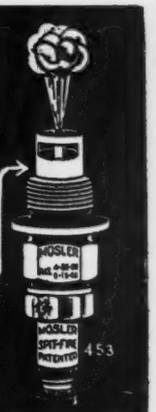
CARTERCAR COMPANY
PONTIAC MICHIGAN

Mosler Spit Fire Plugs are the BEST

FOR 13 YEARS HAVE BEEN LIKE THIS

INSIST ON OUR GENUINE PLATINUM POINTED PLUGS

A. R. MOSLER & CO.,
P. O. BOX "M" MT. VERNON, N.Y.



Marmon "Thirty-Two"

Four-cylinder, 32-40 h. p., 120-inch wheel base, body types and equipment to meet every requirement. A rational, logical car for touring and city use. Years of satisfactory service have proved its economy in tires, fuel and upkeep — plus smooth, delightful operation and durability. Price, $3,000.

"The Easiest Riding Car In The World"

MARMON

Nordyke & Marmon Company (Established 1851) INDIANAPOLIS INDIANA

Sixty Years of Successful Manufacturing

Six-cylinder, 48-80 h. p. 145-inch wheel base with short turning ability, eliminating the old objections to long wheel base. Body types and equipment to meet every requirement. The only big car with small car advantages. Wonderful riding qualities and surpassing power and flexibility. A car developed by years of exacting tests. Price, $5,000.

Marmon "Forty-Eight"

Prest-O-Lite is the most CONVENIENT Lighting System

All the Facts on
All lighting systems
mailed you on request

The Prest-O-Lite Co., Inc.
233 Speedway Indianapolis, Ind.
(Contributor to the Lincoln Highway)

WINTON SIX

Set the Standard

The Winton Six (not any other car) made six cylinders standard and forced four-cylinder cars from the high-grade market. Supreme excellence did it, and you will find that supreme excellence in the Winton Six.

The Winton Six holds the world's lowest repair expense record—25.1 cents per 1000 miles. No other car holds that record, or anything like it. If you want this sort of enduring goodness, look for it in the Winton Six.

SEND FOR CATALOG

THE WINTON MOTOR CAR COMPANY
424 Berea Road, Cleveland, O.

World's First Maker of Sixes Exclusively

PREMIER

AMERICA'S GREATEST TOURING CAR

PREMIER MOTOR MFG. CO.
INDIANAPOLIS, INDIANA

Brictson Pneumatic Tires

At last the pneumatic tire problem has been virtually solved—the weak points in previous tire construction have been eliminated. The resiliency of a **Brictson Pneumatic Tire** puts it in a class by itself. It is Puncture-proof — Blowout-proof — Skid-proof — Rut-proof — Rim-cut-proof—Oil-proof and Gasoline-proof.

Ten Days' Free Trial

To remove all doubt that might arise in the purchaser's mind and to back up our statements—we will allow **10 days' free trial** on the first set that goes into each town.

Your Tires Can Be Made Like This

If you are not in need of new tires and the fabric in your present tires is still good—we can rebuild them the **Brictson Way**—making them **Puncture-Proof, Non-Skidding, Blowout-Proof, Rut-Proof, Oil-Proof and Rim-Cut-Proof.** Write today for full particulars, giving your dealer's name.

THE BRICTSON MFG. CO.
1214 Brictson Bldg.,
Brookings, So. Dak., U. S. A.

10,000 Mile Written Guarantee With every Brictson Heavy Special Tire there goes a 10,000 mile written guarantee which in itself proves their merit

THE ONE-MAN TOP

"IT NEEDS NO CRY FOR HELP"

Golde Patent Top

Complete Tops, Frames, Sockets and Shop Rights

Protected by 11 Patents and other Patents pending

CAN BE HANDLED BY ONE PERSON AS EASILY & QUICKLY AS AN UMBRELLA

INSTANTANEOUS PROTECTION

GOLDE-PATENT MANUFACTURING CO. 513 W. 56th ST. NEW YORK.

"Pass Them All"

Knox

BEST BY TEST

Motor Cars

Send for Pleasure or Commercial Catalogue

KNOX AUTO CO., SPRINGFIELD, MASS.

deSoto Cycle Cars $385

Contract Now to Be Sure of Spring Deliveries

The fastest, neatest two passenger tandem car to be had.

Speed, 40 miles per hour.

35 to 50 miles per gallon of gasoline.

Write today for particulars and specify exact territory wanted.

de Soto Motor Car Company, Auburn, Ind.

BUDD ALL STEEL BODIES

represent the last word in the art of truck body building. They stand for strength, stability, sturdiness and efficiency. Made entirely of steel, they will not rot or crack. They cannot warp or split. They will stand the maximum use or abuse and are practically indestructible. They eliminate fire risk. They are light in weight and easy on tires— pleasing in design and attractive. Summed up in a word, they give the highest degree of Service.

They are made in many styles—of any desired capacity. Estimates promptly furnished. Write us today for full information.

Edward G. Budd Manufacturing Co.

Ontario and I Streets Philadelphia, Pa.

Detroit Office and Showroom, 796 Woodward Ave.

Polarine

FRICTION REDUCING MOTOR OIL

Maintains the correct lubricating body at any motor speed or heat

STANDARD OIL COMPANY

(An Indiana Corporation)

EISEMANN

The performance of Eisemann Ignition Systems during the Indiana-Pacific Tour justifies every claim we have ever made for Eisemann efficiency and dependability.

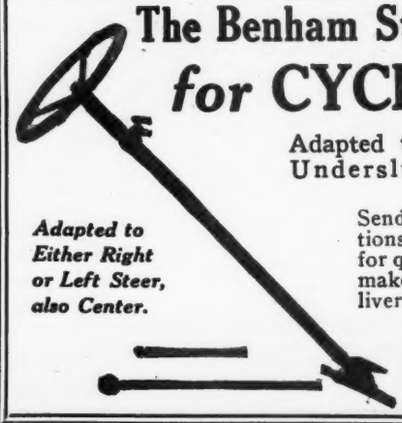
The Eisemann Magneto Company

Sales and General Offices
Bush Terminal, Brooklyn

New York 123 W. 52d St. | Indianapolis, Ind. 514 N. Capitol Ave. | Detroit, Mich. 802 Woodward Ave.

The Benham Steering Gear for CYCLECARS

Adapted to Overslung or Underslung Cyclecars



Adapted to Either Right or Left Steer, also Center.

Send your specifications and requirements for quotations. We can make immediate deliveries.

Benham Mfg. Co.
1882 Mt. Elliott Ave.
DETROIT, MICH.

KINGSTON CARBURETOR

Save Money by Economizing Gasoline

Four floating bronze ball valves opening automatically under different motor suctions supply a uniform mixture at any speed, regardless of hot, cold, wet or dry weather.

Write for details and let us tell you why so many manufacturers are adopting this carburetor as standard equipment

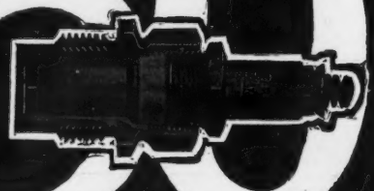
Made by the oldest manufacturers of carburetors in America

ESTABLISHED 1895

BYRNE, KINGSTON & COMPANY, Kokomo, Ind.

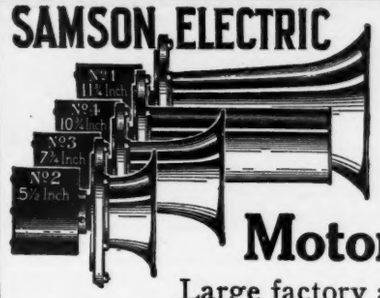
BLACK EAGLE SPARK PLUG

50¢



The STANDARD COMPANY Torrington, Conn.

SAMSON ELECTRIC



4th Season
Big Line
High Grade
New Prices
Both Vibrator and
Motor Driven

Large factory and financial responsibility back of our ironclad guarantee

Live Dealers
Get Our Money Making Offer

AMERICAN ELECTRIC CO., MFRS., State and 64th Streets CHICAGO, U. S. A.

HERZ PLUG
"BOUGIE MERCEDES"

BLUE STONE & STEEL
Guaranteed One Year
Your Dealer or HERZ & CO. New York

KRUPP AUTOMOBILE CRANK SHAFTS, STEEL FORGINGS AND FRAME MEMBERS, GEAR BLANKS, KRUPP BAR STEEL BALL MILLS, TUBE MILLS AND OTHER MACHINERY

KRUPP RESISTANCE WIRE

K R U P P Chrome Nickel Steel

GRILLED IRON L ROLLS

Round Bars in Stock, having a Minimum Elastic Limit 95,000 lbs. per square inch. This steel can be Oil or Case Hardened so as to have an Elastic Limit of over 200,000 lbs.

Use this "TOUGHEST STUFF" and eliminate the Breakages you are now having

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Model "T" Ford Coupe

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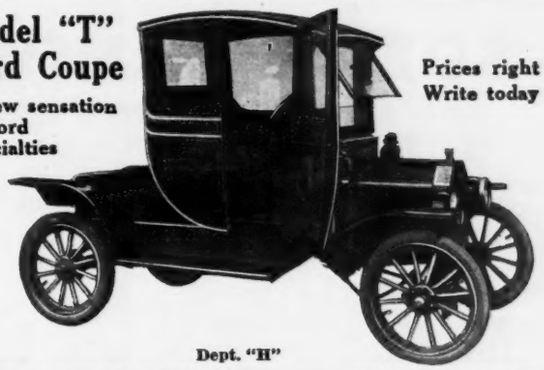

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It is the only top that can be raised or lowered with **one hand** in less than ten seconds. Shop rights to manufacturers. Also complete tops, frames, sockets.

Light—Simple—Rigid

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MANUFACTURED SINCE 1901 FOR HIGH GRADE

AUTOMOBILES AND TRUCKS

3¾ x 5¼ four and six cyl.
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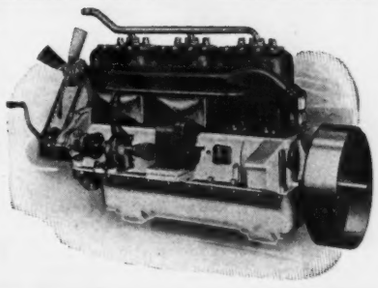
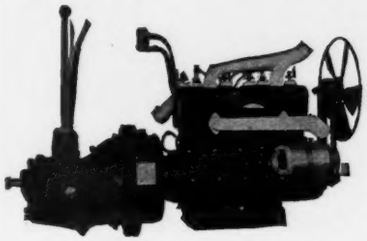
Standard or Unit and
4 x 4, 4½ x 5 and 4¾ x 5 Standard Types. All L Head 4 Cycle.

Manufacturers are invited to investigate our service and our facilities. Literature on request.



The Rutenber Motor Company
Marion, Indiana

Motors G-B & S Motors



We beg to announce our latest four cylinder Unit Power Plant.

This Motor includes the recognized engineering practice, *here and abroad.*

"Craftmanship of long experience is the result of this distinctive Power Plant."

Detailed information on request, and we are in a position to make prompt deliveries according to contract.

GOLDEN, BELKNAP & SWARTZ CO.
DETROIT, MICH.

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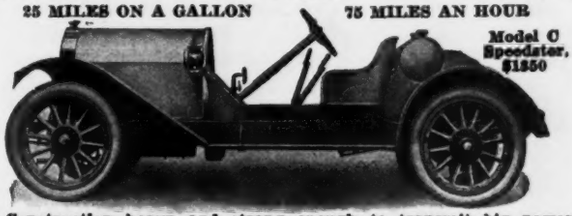
Inaugurating a New Era In Automobile Construction

THE REAL LONG STROKE MOTOR
4¼ Inch Bore (PERFECTED) 7⅛ Inch Stroke

25 MILES ON A GALLON 75 MILES AN HOUR



Model C Speedster, $1350

A Construction heavy and strong enough to transmit big power, but very light and very simply designed. A Motor of 4¼" bore, rated 30 H. P., but developing 90 H. P., on brake test. More flexible than the ordinary 6-cylinder motor. A powerful speed car that can be purchased and operated at very low cost.

Some desirable territory open to agents and distributors

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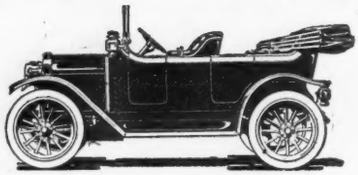
Five Passenger Touring Car



28 H. P. Long Stroke Motor

Enclosed Valves, Three Point Suspension, Unit Power Plant, Platform Rear Springs, Full Floating Rear Axle, Left Hand Drive, Center Control, Drop Frame, Large Tires, Complete Ball Bearing Car

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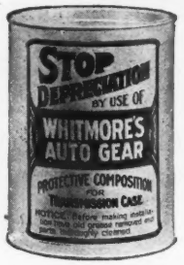

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Auto Gear Protective Compositions produce a thin layer of film on the metal, covering the teeth of both gears and pinions, and making a quiet running outfit.

Gears Lubricated With Whitmore's Auto Gear Protective Compositions

are increased in life from 100 to 500%, and depreciation reduced from approximately 50% a year to 10% a year or less

In ordering Whitmore's Compositions, state definitely for what part of car lubricant is wanted.

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Backed by 15 years of specialization. Found on more high-grade cars than all other makes of lamps.

A Solar Lamp for every motor need.

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TRADE MARK REGISTERED
NON-FLUID OIL
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because your car is NEW, than to have to do so because your car is prematurely OLD.

N. Y. & N. J. Lubricant Co., 165 Bdw'y., N. Y.
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Rim Cutting Entirely Done Away With —Lessens Blow-Outs and Blisters

Easily and quickly attached to valve stem, they take the place of the cap. Compactly made and reduced to the smallest possible size compatible with strength and durability. Running on low air pressure shortens the life of a tire more than any other cause. The Polo Pneumatic Alarm advises you instantly when the pressure falls below a given point, by giving vent to a shrill whistle.

Sold in sets of four, at $6.00 per set

We invite inquiries from dealers and auto users. Write for descriptive folder.

Polo Pneumatic Alarm Mfg. Company
CLEAR LAKE, S. D.

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"32" Touring car, fully equipped	$1050
"32" Roadster, fully equipped	1050
"32" Touring car or Roadster with Westinghouse two-unit electric generator and starter; electric lights; over-size tires, 33x4 inches; demountable rims, extra tire carrier at rear	1200
"32" 6 passenger touring car, fully equipped	1200
With same options as above	1300
Coupe $1350	Delivery Wagon $1075

All prices F. O. B. Detroit

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Braender
Tires & Tubes
are cheapest on mileage

They are strictly high-grade—built to outlast all others—and they do it. Ask any user.

Send for price list and full particulars

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SAMPLES AND PRICES ON REQUEST
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Special AGENTS with Ford cars wanted in unallotted territory.
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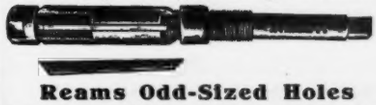
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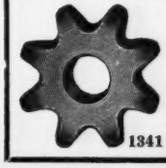
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Don't omit a SPARKS-WITHINGTON Fan from your 1914 specifications. Our One-Piece blade, ball-bearing, radiator fan assemblies cool the motors of more high-class cars than any other fan on the market. There's a reason. SPARKS-WITHINGTON Fans deliver the greatest volume of air with the least H. P. consumption of any fan obtainable. Furthermore, their one-piece construction is positive insurance against blades which loosen, become detached and fly off. Undoubtedly one of our ten standard models is just what you have been looking for. Catalogue and detailed blue-prints on request. Get in touch with us.
The Sparks-Withington Co.
JACKSON MICHIGAN — WALKERVILLE CAN.

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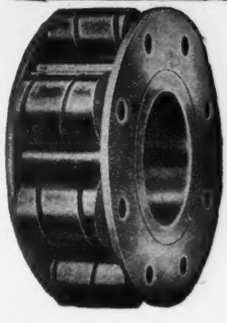
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Seven-passenger, 4-cylinder, Gray & Davis starter and lights, Bosch double ignition; power tire pump, etc. Has only been run very little as demonstrator. Sells for $3,400; for quick sale at $2,200. Johnson Motor Car Co., 455 Peachtree St., Atlanta, Ga.

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New 30 H. P. Tour., Elec. L. & Starter.	$950
New 30 H. P. Roadster, Elec. L. & Starter	900
New 30 H. P. Coupe, fully equipped	850
New 25 H. P. Tour., fully equipped	835
1913 25 H. P. Tour., Demonstrator	550
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These cars are real bargains and guaranteed perfect condition. They must be sold at once to make room for 1914 models.

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The Locomobile Company of America

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Owing to the location of our new general plant at SPEEDWAY, directly on switch tracks, we have on hand four or five second-hand trucks, two to three tons, not in good running order but just the thing for rebuilders and will sell as a lot at nearly junk prices. Here is your opportunity to get something to work on over winter that will bring in real returns. Write at once.
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MARMON 1912 MODEL; SUBURBAN TYPE; lots of extra equipment and accessories; total cost $3,500.00. In splendid shape, driven entirely by owner. On account of change of location have no use for car. Price $1,300.00. Address Department P, P. O. Box No. 408, Cincinnati, Ohio. d

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A $50.00 AIR COMPRESSOR, $18.00; FORD lighting outfits, $2.90; Ford radiator and hood covers, $2.75; Clamp on bumpers, $2.95; Ford master vibrators, $5.50, 6-80 storage batteries, $9.50.
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A1 BARGAINS

30 H. P. Vertical tube radiators	$ 11.00
30 H. P. Steering gears complete (Gemmertype)	12.50
30 H. P. Axles front and rear shaft drive completely assembled and machined and with artillery wheels and demountable rims with springclips, nuts, spare rims, etc	82.50
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Heat treated pressed steel frames with kick up	15.00
Special racing machine 90 M.P.H.	3500.00
G. J. G. 40 H. P. racing machine 70 M.P.H.	1250.00

Above are new, not used or 2nd hand

G. J. G. MOTOR CAR COMPANY.

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Having purchased the repair business of the Henry Motor Co., we are prepared to fill orders promptly for repairs for Henry cars.
Muskegon Automobile Co.,
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Four cylinder Midland, 4¼x5¼" motor	$100.00
Planetary transmission, 10" diameter	15.00
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4 cylinder Cameron air-cooled motors ....each	75.00
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16" mahogany corrugated steering wheels with aluminum spiders	1.50
Mosler spitfire spark plugs, battery type ....each	.40
Oil dash pumps ....each	1.00
Piston rings, all sizes....each	.35
2¾" ball thrusts ....each	.50
2⅝" ball thrusts ....each	.35
2 1/16" ball thrusts ....each	.50
Olds honeycomb radiators....each	30.00
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Detroit demountable rim lugs....each	.05
Detroit demountable rim lugs with nut ....each	.10
Firestone demountable rims, 34x4.each	2.00
Clincher beads, any size ....each	.75
34x4 demountable wheels ..per set of 4	8.00
Midland pressed steel frames, 5-pass.	5.00
Midland frames, 6 cylinder	10.00
Michigan-40 frames	5.00

AUTO PARTS CO.
737-739 Jackson Blvd.
Chicago

ATTENTION: 4 30X3½ TIRES, GOOD, $15 the lot; transmission 3 speed selective, complete, $25; 2 speed planetary, $5; shaft axle, Timken, complete, $25; front axle complete, $5; steering gear complete, $10; clutch complete, $5; toy tonneau body with top, good, $15; racing runabout body with oval gasoline tank, $15; 4 30x3 1-3 wheels, $5 the set; drive shaft with 2 universal joints, $5; radiator fans with bracket, $3; springs ½, ¾ and full elliptic, $3 each; muffler with cut-out, $3; chain, rear axle with hubs, brakes and sprockets, $5. Bongartz, 2743 Ave. D, Brooklyn, N. Y.

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Lowest Prices in the History of the Business

WINDSHIELDS—30 CENTS ON THE DOLLAR

Zig-zag or rain-vision, also clear vision. Single or double section—brass, black or nickel. These windshields are all brand new, of the highest grade of material and workmanship. We guarantee them to be exactly as represented or money cheerfully refunded.

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New Flanders "20" Touring Car tops; made of the best mohair, complete with irons, side and storm curtains; can be made to fit Flanders "20", Ford and Buick "10" touring cars; also other small four-passenger cars. Price $11.85.

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The repair business of the Bergdoll Cars, together with all drawings, jigs, patterns, etc., has been purchased by us. We have a complete stock of repair parts for all models on hand and orders for parts for Bergdoll cars should be placed with us direct to save time.
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All Types and sizes
We also repair or exchange all makes of ball bearings.
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Apparatus price including carbon burner (with gas drums loaned) from
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Wouldn't it be a source of satisfaction to you to be able to leave your Ford for an hour or a day without fear of theft? You can buy just such satisfaction for $1.50—the cost of a
KIMBALL SAFETY CRANK - HOLDER
This attachment for Ford cars is absolute insurance against theft. It also holds crank rigidly in place and
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Can be attached to car in five minutes without alterations.
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All our work guaranteed absolutely new—built to your order. Do not be misled, cores cannot be rebuilt. Write for price on radiators not mentioned in above list.

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Terms: Cash with the order.

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We also have other makes of magnetos at cut prices—in fact, everything for the automobile. Send for "OUR PRICE WRECKER"—the greatest money saver in the world.
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Will finish the metal parts a smooth black finish which will not be affected by heat, grease or gasoline. Ask your dealer.

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Save $25 to $75 by doing the work at home with the Arsenal system. Our big free booklet, "The Car Beautiful," tells how. Send for it today.

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Bakes to either a high gloss, egg-shell gloss or dull finish on all metal parts of automobiles. One coat covers solid. Ask your dealer.

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PRACTICAL VALVE GRINDER AND bearing scraper combined. Guaranteed to seat any valve in two minutes. A perfect bearing assured. With valuable working data by an automobile expert. Price 50c. Master Mechanic, Dept. B, Box 528, Oak-

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The finest air drying black enamel for all around work on automobiles. Use on all kinds of metal or wood. Dries with a gloss finish. Ask your dealer.
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Detroit Radiators are built right, work right and stand up right. Every one guaranteed new and not to break through freezing.

A FEW STOCK RADIATORS

Ford T, special construction	$20.00
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Every radiator guaranteed absolutely new, not a reconstructed one.

In stock for immediate shipment.

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We also have all repairs for the Wayne, Queen and Northern cars.

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Every car should have a radiator cover in cold weather.
Write for prices.
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NEW.	NEW.
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All other makes at equally low prices. Send us your old radiator for repairs or exchange on a new one.

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Full stock for all cars
Prompt shipment
Ford covers, $1.40; other cars, $2.50.
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For dusting and polishing automobile bodies, windshields, lamps, pianos or any other polished surface. House Size 25c. Automobile Size 50c. Sent to any address upon receipt of price. If not satisfied, return duster and we will refund purchase price.

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Manufacturers of Portable (weight 40 lbs.) and stationary welding, cutting or lighting plants; supplies of all kinds. Agents wanted. Fulton & Enfield Sts., Brooklyn, N. Y.

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Easy learned. Book 50c.
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"WE HAVE JUST TAKEN IN EXCHANGE 2-ton Saurer chassis in fine condition. 4 speed transmission direct on 3d. 4 cyl. long motor. Bosch high tension magneto.
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WELDING PLANT, CUTTING PLANT, carbon removing outfit, or a combination of all of these at from $75.00 to $175.00 for high or low pressure system. For full particulars, address Bermo Welding Apparatus Co., Omaha, Nebr.

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And there is no question but what FORE DOORS improve the appearance of any car as nothing else will, but when compared to the added comfort and pleasure which they give to both driver and passenger, appearance becomes a secondary condition. FORE DOORS installed on any make of car. Also write me about commercial bodies for the Ford car.

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YOUR MOTOR WILL START EASY IF YOU get the quality of gasoline you pay for. Our gasoline hydrometer proves this. Guaranteed postpaid complete with test jar $1.00. Hydrometer for testing amount of charge in storage battery, guaranteed accurate, postpaid $1.25.
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50 NEW PRESSED STEEL FRAMES, 163" long, 34" wide. Each, $10.00.
Send for sketch.
Lucas & Son, Bridgeport, Conn.

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FUR LINED OVERCOATS AT ONE-fourth value. Manufacturers' samples. Gentlemen's imported black broadcloth overcoats, lined with finest Australian mink, large handsome Persian lamb collar. All sizes. Retail value $120. While they last will be sacrificed for $35 each. First come first served. You take no risk. Examine and try on before paying. Write today, stating size, enclosing express charges only and coat will be sent at once. E. Roberts, Room 7, 160 West 119th St., New York.

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WANTED FOR MODEL K9 STODDARD-Dayton—Transmission case M3100, clutch, steering wheel and control, Bosch magneto D. U. 4, dash and two bucket or roadster seats.
Address Box D 586, c/o Motor Age. a

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CYCLECAR

We will furnish designs and blue prints for either tandem or side-by-side seating, also all necessary parts to build same, blue prints and full information, $5.

We are prepared to furnish parts which have been thoroughly tested out on the road—no experiment. Front and rear axles, springs, steering gears, wheels and frictions.
Write for information.
Fenton Engineering Co., Fenton, Mich.

PARTS FOR CYCLE CAR OR LIGHT RUNABOUT

High Grade Pressed Steel Hubs
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AUTO WANTED

160 acres of nice level land, good soil, all fenced, no rocks or stumps, near neighbors, good crops, at $20.00 per acre. Will take a good car as part pay. State price and describe fully first letter. I am an old cuss but don't want an old cuss of a car.
A. L. STONE,
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Will trade 40 acres irrigated land with fully paid water right. Investigation will prove a bargain at $75 per acre. Will consider second hand Pierce Arrow, Franklin, Cadillac or other high grade car in first class condition. Address
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FARM OF 60 ACRES TO TRADE FOR AUTO and get difference. Farm all improved. Soil black, sandy loam, ½ mile to railroad, fine location. Reason for selling, other business. If interested write A. Myers, Pullman, Mich.

FIFTY CARS WANTED FOR CASH.

Have customers waiting; if you want to sell your car quick, consign it to us; no charge whatever; we get our profits over your net figure; it is your privilege to remove car at any time without notice; will send for your car free within 200 miles.
American Used Motor Car Co.,
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500 Bergen Street, Near Flatbush Ave.

TO EXCHANGE, S. D. LAND FOR A GOOD auto. Give full description of auto and price in first letter.
Box 91, Edgeley, N. Dak. c

WANTED—TO BUY FAST RACING CAR capable of 85 m. p. h. cheap. Must be in first class condition ready for track. Send photo and specifications in first letter. Box 114, Houston, Tex. b

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GRADUATE MECHANICAL ENGINEER with ten years' varied experience in automobile industry open for position, mechanical or executive. Manager of service and parts division of large corporation for past year and a half. Address Box D 597, care Motor Age. h

POSITION WANTED AS MANAGER OF garage or automobile business. I am now filling such a position with one of the largest garages in the Central West, of which I am part owner and am making this change solely on account of desire to change location. If you want your business increased and put on a good sound, paying business basis, your correspondence is respectfully solicited. Will be in position to change location about Jan. 1st, 1914. For further information address Box D 566, c|o Motor Age. a

POSITION WANTED—MANAGER FIRST- class garage, or foreman first-class repair shop. Eight years experience. Expert mechanic; reliable, sober. Only solid firms answer. Further particulars, address R. J. Marquard, 1026 N. Water, St., Decatur, Ill.

VULCANIZER OF LONG EXPERIENCE wants to connect with some firm about Feb. 1. At present employed. Address Box D 593, c|o Motor Age. h

WANTED—POSITION AS REPRESENTA- tive in either Japan, Australia or South America. Speaks French and Japanese. Six years experience as automobile salesman. Now employed by one of the highest class automobile factories in America. Best references. Write Box D 595, care of Motor Age. l

WANTED—POSITION BY FIRST-CLASS auto mechanic as chauffeur for private family; 10 years' practical experience; any make of car; do own repairing. Strictly sober and reliable; references; married. Address F. Meyer, 413 Eleventh street, Milwaukee, Wis.

Help Wanted

AUTO ACCESSORY SALESMAN WANTED to sell our guaranteed auto tire reliners, double locks, inner and outer shoes, etc. Liberal commissions and exclusive territory.
AMERICAN RUBBER PRODUCTS CO.,
24 So. Clinton St., Chicago, Ill.

MEN AND WOMEN GET GOVERNMENT jobs; $65 to $150 month. Examinations everywhere soon. Write immediately for free list of positions now available and Spring Examination schedule. Franklin Institute, Dept. C-71, Rochester, N. Y.

ROAD MAN—SIDE LINE; COMMISSION $6.40 each sale, appointing agent and $1.40 on agents' sales for introducing appliance to auto owners, garages or shops. Small sample. Autolite Deflector, Room 404, 38 So. Dearborn St., Chicago.

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Long established concern, manufacturing a line of heavy duty motor trucks, has a place for a sales and advertising manager. He must be a man of the very highest order of ability, with a record for making good and preferably experienced in selling motor trucks. All correspondence confidential. Address Victor L. Brown, West Allis, Wis.

SALESMEN WANTED TO HANDLE OUR line of plain and embossed gauntlets, exclusively or sideline. The best glove proposition on the market. Gloversville Gauntlet Co., Box 2-2-2, Gloversville, N. Y.

TRAVELING SALESMEN

Side line. I manufacture an article that sells to every repair shop and garage.
D. Ogden, Columbus, Ind.

WANTED—AN A No. 1 REPAIR MAN, ONE especially good on ignition and self-starters; small town northwest Iowa. Please state salary wanted and number years experience in first letter. Position open about March 1. C. P. Buswell, Meriden, Iowa.

WANTED—AUTO REPAIR MAN; MUST BE number one, high-class man; a good trouble finder and an expert on adjustments, such as carburetors, magnetos and generators; good wages; steady job year round. Address Box D 594, c|o Motor Age. l

WANTED—SALESMEN TO SELL MOTOR car appliances. Here is a money-making proposition for live salesmen. A line of quick-selling motor car accessories. Write for territory. Address "Sales Manager," 652 Woodward Avenue, Detroit, Michigan. g

WE ARE CONSTANTLY IN TOUCH WITH Employers requiring High-Grade Engineering service. Are you listed with The Toledo Engineering Agency, Toledo, Ohio?

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YOU CAN GREATLY INCREASE YOUR income by representing our line of lighting systems; our
MATCH LIGHTING LAMPS
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Index to Advertisements

A

Adams & Westlake Co....Cover
Alma Motor Truck Co.... 125
American Ball Bearing Co. 141
American Bronze Co..... 1
American Electric Co.... 131
Apple Electric Co..... 118
Atwater Kent Mfg. Works 124
Auto Specialty Co..... 131
Automobile Chamber of Commerce 100
Automobile Supply Mfg. Co. 125

B

Badger Brass Mfg. Co.... 132
Baker Motor Veh. Co..... 96
Barthel & Daly..... 124
Bartholomew Co. 115
Beach, T. C. Auto Turntable Co. 133
Benham Mfg. Co..... 130
Benton L. F. Co..... 126
Bosch Magneto Co..... 3
Braender Rubber & Tire Co. 132
Brennan Motor Mfg. Co.. 126
Bretz, J. S. Co..... 80
Brietson Mfg. Co..... 129
Bridgeport Brass Co..... 124
Briggs-Detroiter Co..... 132
Brown Co. 121
Brown-Taylor-Greene Co....112d
Buda Co. 116
Budd, E. G., Mfg. Co..... 130
Buob & Scheu..... 133
Byrne, Kingston & Co..... 130

C

Cartercar Co. 129
Chadwick & Trefethen.... 133
Chalmers Motor Co..... 94
Chicago Automobile Supply House 133
Classified .....134 to 140
Clearing House 141
Cleveland - Canton Spring Co. 126
Connecticut Tel. & Elec. Co 123
Connecticut Shock Absorber Co. 123
Continental Motor Mfg. Co. 128
Corbin-Brown Speedometer. 143
Corcoran Lamp Co..... 124
Covert Motor Vehicle Co.. 124
Cox Brass Mfg. Co..... 113
Cullman Wheel Co..... 133

D

Dann Oil Cushion Spring Insert Co. 107
Dayton Engineering Lab. Co. 94
DeSoto Motor Car Co..... 130
Detroit Steel Products Co. 126
Dorris Motor Car Co..... 124
Dunwoodie, David..... 120
Eisemann Magneto Co.... 130
Electric Auto-Lite Co..... 112
Empire China Works..... 126

F

Firestone Tire & Rubber Co. .....Cover
Ford Motor Co..... 121
Frontier Specialty Co..... 117
Fulton, The, Co..... 120

G

Gabriel Horn Mfg. Co.... 115
Gas Saver & Back Fire Preventer Co..... 127
Golden, Belknap & Swartz Co. 131
Golde Patent Mfg. Co..... 129
Goodrich, B. F. Co..... 97
Gould Storage Battery Co.112h
Gray & Davis 4

H

Ham, C. T. Mfg. Co..... 126
Hartford Suspension Co... 2
Hassler, R. H..... 133
Haynes Automobile Co.... 127
Haywood Tire & Equipment Co. 124
Heinze Electric Co..... 142
Henderson Motor Car Co.. 128
Herff-Brooks Corp..... 126
Herreshoff Motor Co..... 127
Herz & Co..... 131
Hess-Bright Mfg. Co..... 95
Hess Spring & Axle Co.... 128
Holley Bros. Co..... 110
Hotel La Salle 118
Hotel McAlpin.....112h
Houk, Geo. W. Co..112b & 112c
Hoyt Electric Instrument Works 133
Hupp Motor Car Co..... 132
Hyatt Roller Bearing Co.. 133

J

Jackson Automobile Co.... 108
Jeffery, Thos B., Co.....78-79
Johns, H. W.,-Manville Co. .....99 & 112g
Jones Electric Starter Co.. 128

K

K-W Ignition Co..... 111
Keeton Motor Co. Back Cover

Index to Advertisements

Kissel Motor Car Co..... 127
Knox Automobile Co..... 130
Kokomo Electric Co..... 132

L

Leece-Neville Co. 103
Lincoln Highway Ass'n... 118
Lippard-Stewart Motor Car Co. 89
Lovell-McConnell Mfg. Co. 71
Lyons-Atlas Co. 101

M

McCormick Mfg. Co..... 121
McQuay-Norris Mfg. Co.. 72
Manzel Bros. Co..... 117
Maxwell Motor Co..... 141
Mayo Mfg. Co..... 121
Mayo Radiator Co..... 142
Mercer Automobile Co.... 124
Metallic Automobile Matting Co. 125
Metropol Motors Corp..... 131
Metz Co. 127
Mix, M. W..... 106
Moline Automobile Co..... 76
Morrison-Ricker Mfg. Co... 123
Mosler, A. R. & Co..... 129
Motor Car Supply Co..... 133
Motor Print 98
Motsinger Device Mfg. Co. 119
Mutty, L. J., Co..... 133

N

National Motor Vehicle Co. 81
New Departure Mfg. Co... 77
New Era Spring & Specialty Co. 128
N. Y. Coil Co..... 113
New York & New Jersey Lubricant Co. 132
Nordyke & Marmon Co.... 129

O

Oxygen Decarbonizer Co... 125

P

Packard Motor Car Co.... 144
Paige-Detroit Motor Car Co. 74-75
Pantasote Co.....112g
Peacock, Clarence N., & Co. 114
Pilot Car Sales Co..... 128
Polo Pneumatic Alarm Co. 132
Poyer, D. F. Co..... 116
Premier Motor Mfg. Co... 129
Prest-O-Lite Co. 129
Prosser, Thos., & Son..... 131
Pullman Motor Car Co.... 128

R

R. I. V. Co..... 91
Rauch & Lang Carriage Co. 92
Remy Electric Co..... 122
Republic Rubber Co..... 126
Rhineland Machine Works Co. 93
Rutenber Motor Co..... 131

S

Saxon Motor Co.....85 to 88
Schrader, A. Sons..... 119
Searchlight Gas Co..... 128
Shaler, C. A. Co.....112e
Sharrer Patent Top Co.... 131
Sheldon Axle Co.....112b
Simplex Specialties Co.... 126
Sparks Withington Co..... 133
Spicer Mfg. Co.....112a
Splitdorf Electrical Co.... 84
Spring Leaf Lubricator Co. 119
Standard, The Co..... 130
Standard Oil Co..... 130
Star Ball Retainer Co..... 127
Stewart Motor Corp..... 105
Stromberg Motor Devices Co. 69

T

Twitchell Gauge Co..... 90

U

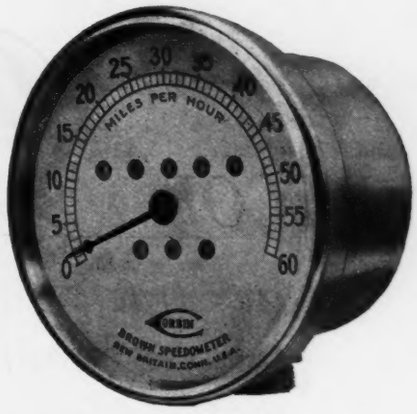
United Steel Co..... 123

V

Veeder Mfg. Co..... 122
Vulcan Mfg. Co..... 127

W

Wadhams Oil Co..... 122
Ward-Leonard Electric Co. ..... Front Cover
Warner Gear Co..... 123
Warner Mfg. Co..... 109
Weld Mfg. Co..... 120
Westinghouse Electric & Mfg. Co.....82 & 83
Weston Electrical Inst. Co. 122
Wheeler & Schebler 70
Whitney Mfg. Co..... 118
Whitmore Mfg. Co..... 132
Willard Storage Battery Co. 73
Willys-Overland Co. 102
Winton Motor Car Co..... 129
Wood Mfg. Co..... 127



These features incorporate to make the

CORBIN-BROWN

SPEEDOMETER

"The Speedometer of Absolute Accuracy"

A steady hand on a rough road—
A dial that is instantly read —
A mechanism of extreme simplicity—
A principle irrefutably correct.

Write for the New Catalog

The Corbin Screw Corporation
The AMERICAN HARDWARE CORPORATION, Successors
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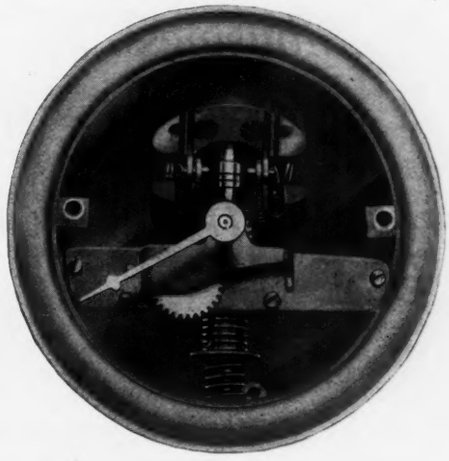


Packard

RECORD SHIPMENTS FOR 1913

In April, 1913, a new high record for one month's shipments of Packard motor carriages.

¶ *In April, 1913, a new high record for one month's shipments of Packard motor trucks.*

¶ *In May, 1913, shipments of Packard motor carriages exceeding the previous record made in April.*

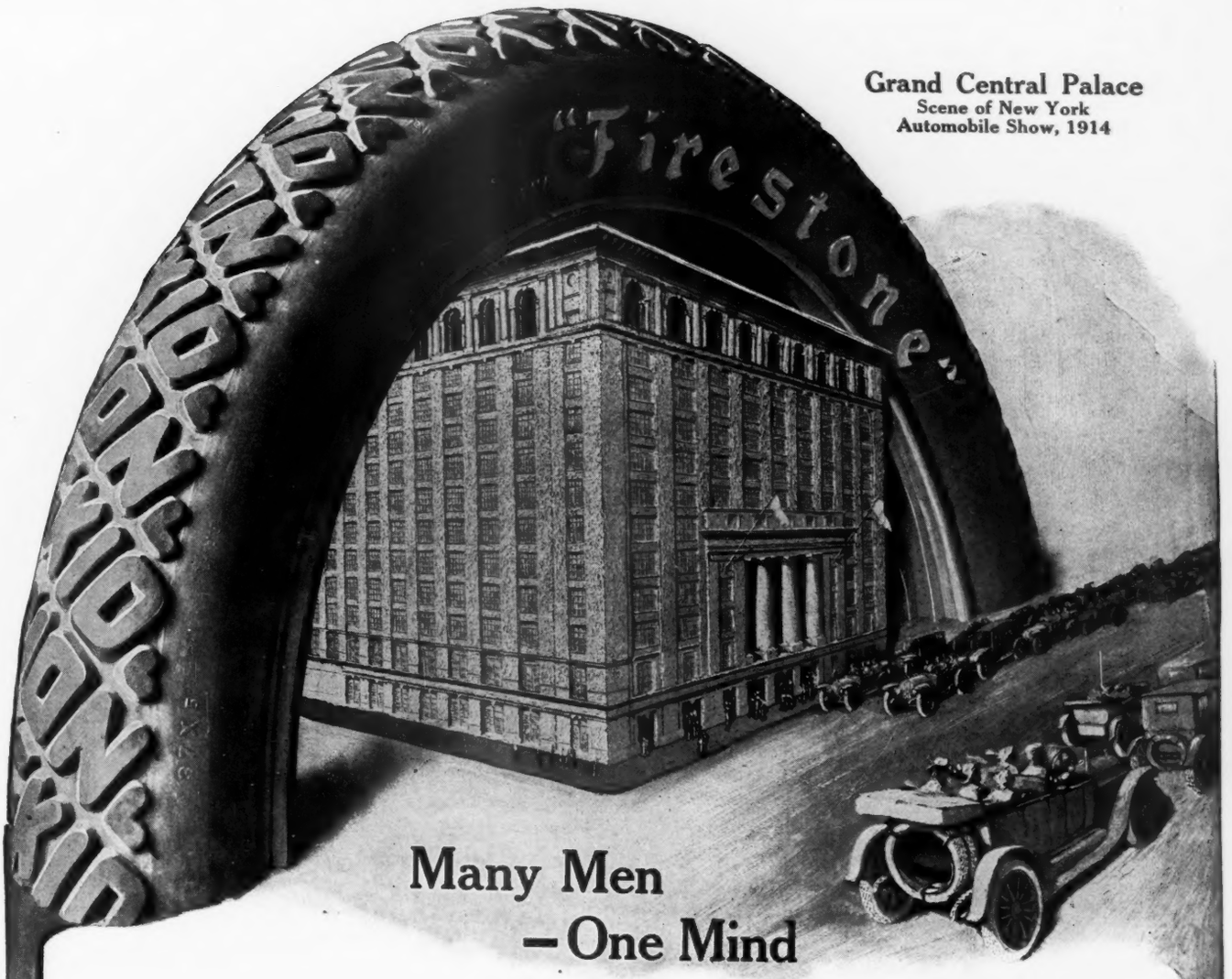
¶ *In November, 1913, a new high record for one month's shipments of Packard enclosed bodies.*

¶ *The total Packard shipments for 1913 were the largest for any one year since the Company started in business.*

ASK THE MAN WHO OWNS ONE

Packard Motor Car Company, Detroit

LINCOLN HIGHWAY CONTRIBUTOR



Grand Central Palace
Scene of New York
Automobile Show, 1914

Many Men —One Mind

However much car buyers at the New York Automobile Show may differ as to the merits of their favorite cars, we are safe in predicting a general demand for Firestone Tires.

The motoring demands of these "Many Men" will be as diverse as the wide territory they represent, but extremes of heat and cold; mountains and mud; boulevard and trail—all are alike overcome by the in-bred Firestone Quality. Besides, there is the incontestable advantage in 14 years of supremacy capped by the super-service of 1913.

Therefore—no matter what car is selected; no matter what their travel-demands, these men will be of "one-mind" to specify Firestone Tires—and their—Most Miles Per Dollar.

The Firestone Tire & Rubber Co., Akron, Ohio—*All Large Cities*

"America's Largest Exclusive Tire and Rim Makers"

Pneumatic Tires, Truck Tires, Pleasure Electric Tires, Carriage Tires, Fire Apparatus Tires, Rims, Tire Accessories, etc.

Firestone
NON-SKID TIRES

The Car of Distinction

The New Six-48 Keeton represents all the "finer points" of both European and American design. The French type of hood with dash radiator—the stream line body—the curve of the fenders—the wire wheels—in fact, every detail has a pleasing harmony of line combined with a practical ease and comfort in use.

The simplicity and graceful strength of the chassis insure a surprisingly long and care-free service to the owner, which, coupled with the satisfaction and pleasure derived from use, places the Keeton in a class by itself.

Many dealers throughout the country are finding out that they can make a very advantageous agency connection by getting in touch with us. Have we heard from you?

KEETON SPECIFICATIONS

Motor—Six Cylinder, 4" bore, 5" stroke, cast en bloc, "L" head.

Ignition—Eisemann Dual High Tension Magneto, Automatic, Spark Advance.

Electric Starting Lighting—"Jesco" Starting and Lighting System, single unit type.

Cooling—Centrifugal Pump and powerful flywheel fan insure ample cooling.

Front Axle—Elliott type, ball thrust bearing in yoke head.

Rear Axle—Full floating type, gear ratio 3¾" to one. Imported annular bearings.

Brakes—Brakes cam actuated, internal expanding, large diameter.

Control—Left side drive, right-hand control.

Steering—Worm and full Gear Type with thrust bearings, 18" or 20" walnut wheel.

Clutch—Cone shaped steel discs running in oil housed in flywheel.

Transmission—Selective type, 4 speeds forward and reverse, direct on third, imported annular bearings.

Wheels—Five interchangeable wire wheels 34" in diameter, 4½" tires.

Speedometer—Warner Autometer with clock combination.

Horn—Klaxon.

Tire Pump—Mechanically operated, two cylinder compressor.

Wheel Base—136".

Equipment—Unusually detailed and complete.

PRICES—F. O. B. DETROIT.

2 Pass. Roadster, completely equipped..$3250
7 Pass. Touring Car, completely equipped 3250

A full line of open and closed bodies.

CAR-NATION

The Car for the American Public

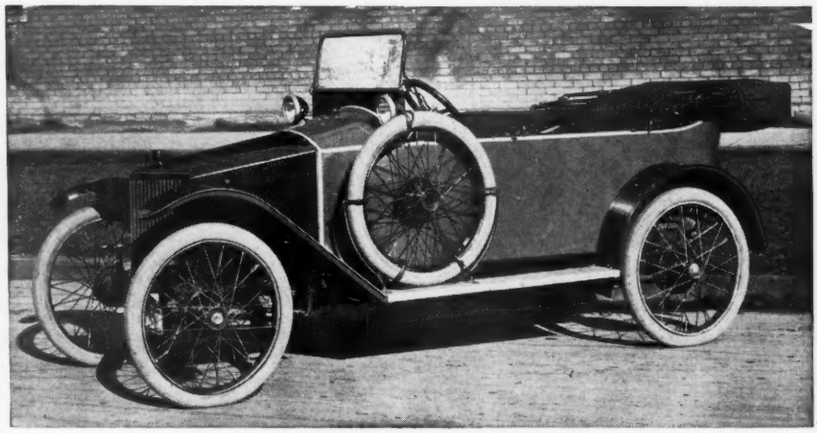
The Logical Small Car

The Car-Nation is not a freak. It is a "small big car" possessing all the features of the heavy, expensive cars as well as the light weight, low initial and up-keep cost of the cycle cars.

Built in two and four passenger models, the Car-Nation is pre-eminently qualified to supply the popular demand for this type of car.

The "Car-Nation" is not an experiment, it has been tried out and proven a success under all imaginable conditions. It costs very little to operate, 25 to 30 miles to a gallon of gasoline. The wire wheels give a surprising tire mileage and the snappy, foreign appearance attracts attention immediately.

DEALERS—Be first in your territory. We have a very profitable agency agreement. Let us hear from you at once.



4-Passenger CAR-NATION Touring Car

CAR-NATION SPECIFICATIONS.

Unit Power Plant—Motor—4 cyl., en bloc, 3⅜x3¾, "L" head—large valves and bearings. Very quiet and powerful.

Ignition—Magneto—Fixed spark.

Lubrication—Constant level splash—plunger pump.

Carburetor—Approved type—very economical.

Cooling—Thermo syphon. V-shaped radiator—adjustable belt-driven fan.

Clutch—Multiple steel disk type running in oil.

Transmission—Selective type, 3 speeds forward and reverse—one lever control.

Drive—Bevel gear through concentric torque tube with one universal joint.

Rear Axle—Semi-floating type, Hyatt roller bearings.

Brakes—Emergency, internal exp. on 10" drum on rear wheels. Service external contracting on transmission shaft.

Wheels—Detachable wire—30x3" clincher rims and smooth tread tires.

Control—L. H. drive, center control.

Wheelbase—104".

Tread—48".

Standard equipment—Oil head lamps and tail lamps with set of tools.

PRICES

Model A—2 Pass. Roadster.....$495
Model B—2 Pass. Tandem Type..... 510
Model C—4 Pass. Touring Car..... 520
Extra Equipment: Top, $25; Windshield, $10

Manufactured by THE AMERICAN VOITURETTE CO., Detroit, U.S.A. See our Exhibits at New York and Chicago